



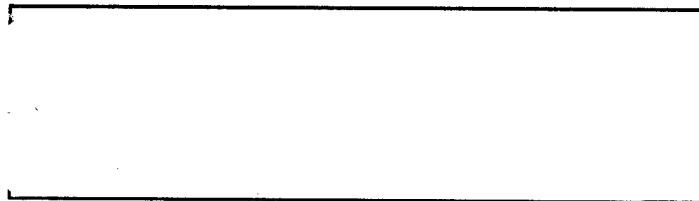
**U.S. Army
Environmental
Center**

**FINAL
GROUNDWATER CLASSIFICATION DOCUMENT
FORT SHERIDAN, ILLINOIS**

**Volume I
Sections 1.0 - 6.0 and
Appendices A - B/GEA5**

Contract No. DAAA15-90-D-0017
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February 8, 1996



U.S. ARMY ENVIRONMENTAL CENTER
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Prepared by:



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Groundwater Classification
Document**

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List of Acronyms and Abbreviations

AP	Administrative Procedure
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BRA	Baseline Risk Assessment
btoc	below top of casing
CERCLA	Comprehensive Environmental Response Compensation & Liability Act
CSA	Coal Storage Area
DA	Department of the Army
ESE	Environmental Science & Engineering, Inc.
ft-bgs	feet below ground surface
GEA	Groundwater Evaluation Area
GPD	gallons per day
GPM	gallons per minute
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
K	hydraulic conductivity
MFP	Missile Fueling Point
MW	Monitoring Well
NCP	National Contingency Plan
RI	Remedial Investigation
SB	Soil boring
USACE	U.S. Army Corp of Engineers
USAEC	U.S. Army Environmental Center
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VES	Vehicle & Equipment Storage

Executive Summary

The State of Illinois has developed groundwater classes and corresponding groundwater quality standards for the protection of its groundwater. The classes of groundwater and their designation criteria are promulgated in the Illinois Groundwater Standards 35 IAC Part 620 Subpart B (Subpart B). Subpart B provides for all groundwaters of the State of Illinois to be designated as one of the following four classes: 1) Class I - Potable Resource Groundwater; 2) Class II - General Resource Groundwater; 3) Class III - Special Resource Groundwater; and 4) Class IV - Other Groundwater. In addition, a specific area may be designated as a groundwater management zone in accordance with requirements set forth in Section 620.250 of Subpart B. Fort Sheridan is currently conducting environmental investigations as part of an Installation Restoration Program. These investigations are being implemented consistent with the Comprehensive Environmental Response Compensation & Liability Act (CERCLA) and the National Contingency Plan (NCP). These groundwater quality standards are potentially applicable or relevant and appropriate requirements (ARARs) for Fort Sheridan. The classification of shallow groundwater resources at the installation is a key element in the evaluation of analytical data collected, as well as the determination of cleanup objectives. Because it is important to determine the classification of the shallow groundwater at the installation early in the remedial investigation (RI) process, this groundwater classification document has been prepared.

This document presents an evaluation of data pertinent to the assessment of shallow groundwater resources at Fort Sheridan. It summarizes information collected during RI and other activities conducted at Fort Sheridan over the past several years by Environmental Science & Engineering, Inc. (ESE) and other consultants on behalf of the Department of the Army (DA).

A Phase I RI was conducted in 1991 and 1992. The purpose of the RI was to assess the nature and extent of potentially affected environmental media related to Fort Sheridan mission activities. During the Phase I RI, 35 separate study areas of potential environmental concern were investigated. These investigations generated a considerable amount of information concerning the geology/hydrogeology at Fort Sheridan. Much of this information is pertinent to the classification of the shallow groundwater at the

installation. This information includes soil boring/monitoring well logs, test pit logs, results of slug/baildown tests, results of physical sample analysis and observations of monitoring wells during development and sampling events.

Phase I RI field activities included the advancement of 91 soil borings to various depths and the installation of monitoring wells in 61 of the borings. A detailed log of the geology encountered was compiled by a geologist/engineer. With few exceptions, the soil borings were logged continuously. A total of 49 test pits were excavated with a backhoe. These test pits were excavated to 14.5 feet below ground surface (ft-bgs) or less. In addition to providing a visual cross-section of the various soils encountered, the soils were logged by a geologist/engineer during the excavation.

A total of 74 soil samples from 38 soil borings and 7 test pits were submitted to ESE's Gainesville, Florida laboratory for physical soils analysis. The moisture content (% moisture), grain size distribution (by sieve analysis), and Atterberg limits (liquid and plastic limits) were determined for each sample. These data were used to evaluate the field soil descriptions included on the boring logs. Slug tests/baildown tests were performed in nine monitoring wells to evaluate the hydraulic conductivity of the geologic material screened in each of the wells. Slug tests were performed in monitoring wells LF2MW06S, LF7MW04S, B125MW01B and LF6MW04D. Baildown tests were performed in LF2MW08D, LF5MW04S, LF6MW04S, B208MW07, and B208MW06.

The predominant soil type at Fort Sheridan is a lean clay described under the Unified Soil Classification System (USCS) as a CL soil. Grain size distribution analysis (sieve analysis) was performed on 72 soil samples collected during soil boring advancement. The types of soils analyzed and numbers of each type analyzed were generally representative of the soils encountered in the soil borings and test pits. For the 60 samples described as lean or fat clay, USCS descriptors CL or CH soils, respectively, sieve analysis data indicate they are, on average, composed of more than 85 percent fines (i.e., material that will pass a #200 mesh sieve).

Of the nine hydraulic conductivity tests performed, seven of them were in wells screening primarily CL or CH soils. The geometric mean of the hydraulic conductivity values from these seven wells is 3.6×10^{-6} cm/sec.

In addition to the Phase I RI, several other studies have been conducted at Fort Sheridan. These studies also contain specific information concerning the geology/hydrogeology at Fort Sheridan. These studies varied in scope from installation-wide to limited areas of investigation around landfills and/or buildings. Information from these additional studies germane to the evaluation of the shallow groundwater resources beneath Fort Sheridan includes:

- Boring logs, piezometer construction details, boring/well location maps, cross-sections, and grain size distribution curves from a bluff erosion correction study conducted near Landfill 7 (Bernheim et al, 1981).
- Interpretive groundwater elevation contours based on potentiometric data from a previous study of infiltration to Fort Sheridan's sanitary sewer system (Zimmer and Howell, 1985).
- Boring logs, well point installation logs, test pit logs, and permeability test results from a final design analysis study conducted in the area around Landfills 6 and 7 (Greeley-Hansen, 1980).
- Soil boring logs from an ongoing landfill closure study at Landfill 7 (ESE, 1995).
- Soil borings from an ongoing UST study near Building 208 (USACE, 1995).
- Water supply well information from a 45-day report prepared for a UST investigation at Building 368 (USACE, 1994).

To facilitate the evaluation of groundwater at Fort Sheridan, data collected during the Phase I RI and additional information gathered during other projects at the Fort have been grouped to provide a broad perspective and comprehensive view of the hydrogeology of Fort Sheridan and to facilitate organized management of the large quantity of data. The grouping of RI study areas is based on their physical proximity; however, in some cases, proximal sites are grouped separately to facilitate the

management of the data. Six areas, referred to as *Groundwater Evaluation Areas (GEAs)*, have been established solely for the purpose of evaluating the hydrogeology.

Data collected from Landfill 1, Missile Fueling Point (MFP) and Building 126 were used to evaluate GEA 1 located near the northwest corner of the fort. Data collected from Landfill 2, near the northeast corner of the installation, were used to evaluate GEA 2. The data collected from Landfills 3 and 4, Coal Storage Areas (CSAs) 2 and 3, and Vehicle and Equipment Storage (VES) Areas 1 and 2 were used to evaluate GEA 3 located near the central portion of the installation. Data collected from Landfill 5, Buildings 208, 377 and CSA 4 were used to evaluate GEA 4. Data collected from Buildings 115, 122, 125, 128, and 137; CSA 1; and VES 5, 6, and 7 were used to evaluate GEA 5. Data collected from Building 368, Landfills 6 and 7, and VES 9 were used to evaluate GEA 6.

As discussed previously, Subpart B of 35 IAC 620 establishes criteria for the classification of the Illinois groundwaters into four categories. According to these criteria, the designation of Class III - Special Resource Groundwaters and Class IV - Other Groundwaters do not appear appropriate at Fort Sheridan. Specific areas may, at some point, qualify as Class IV; however, at this point in the RI this designation has not been made.

With the exclusion of Class III and IV designations, the discussion narrows to a determination of either Class I or II eligibility. Class II - General Resource Groundwater is a catchall category incorporating those groundwaters not specifically included in the other categories. To qualify as Class I - Potable Resource Groundwater, the groundwater must be:

a) located 10 or more feet below the land surface and within:

- 1) The minimum setback zone of a well which serves as a potable water supply and to the bottom of such well;
- 2) unconsolidated sand, gravel, or sand and gravel which is five feet or more in thickness and that contains 12 percent or less of fines (i.e., fines which pass through a No. 200 sieve)

- 3) sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or
- 4) any geologic material which is capable of a:
 - A) sustained groundwater yield from up to a 12-inch diameter borehole, of 150 gallons per day or more from a thickness of 15 feet or less; or
 - B) hydraulic conductivity of 1.0×10^{-4} centimeters per second (cm/sec) or greater using one of the following test methods or its equivalent:
 - i) permeameter;
 - ii) slug test; or
 - iii) pumping test.

Several soil borings/test pits encountered course grained material at less than 10 ft-bgs(e.g., the wells installed on the beach at Landfills 2 and 7). Geologic material occurring at less than 10 ft-bgs is specifically excluded from consideration as a Class I groundwater resource. Soil borings that exhibited no other potential Class I groundwater resource material are by default designated Class II.

Saturated soil intervals that potentially meet at least one of the criteria for a Class I groundwater resource are present at fifteen locations. These locations are represented by wells LF1MW03D, LF7MW02, LF1MW01, LF1MW02, LF1MW04, LF2MW02, LF5MW02, LF7MW05D, LF7MW04D, LF7MW06D, and B208MW04.

The preponderance of available data suggests that the hydrogeologic setting at Fort Sheridan is best characterized as a Class II groundwater resource. The regional literature describes the geologic material at Fort Sheridan as a massive clay till that includes localized lenses of coarser material. These lenses of silt, sand, and/or gravel are discontinuous and are not hydraulically distinct from the clay matrix in which they are found. Specific data obtained on the installation corroborate this description. Soil borings and test pits have been completed at widely distributed locations at Fort Sheridan at up to 74 ft-bgs without encountering an areally extensive source of Class I groundwater. Evaluation of the hydraulic conductivity and development/presample purging information from the wells at Fort Sheridan indicates that, the saturated intervals are not capable of a sustainable yield of 10 gallons per minute or 150 gallons per day. The possible exceptions to this statement are the saturated sand encountered at

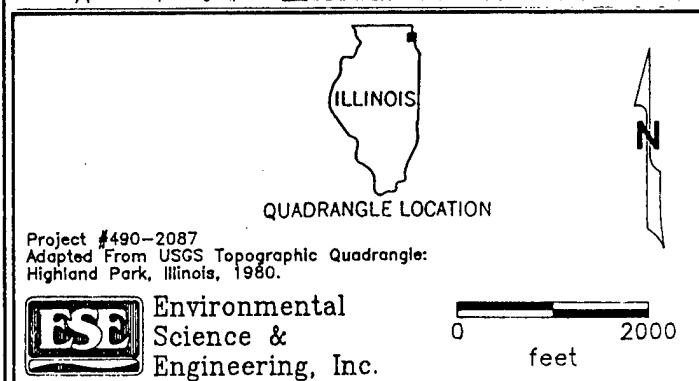
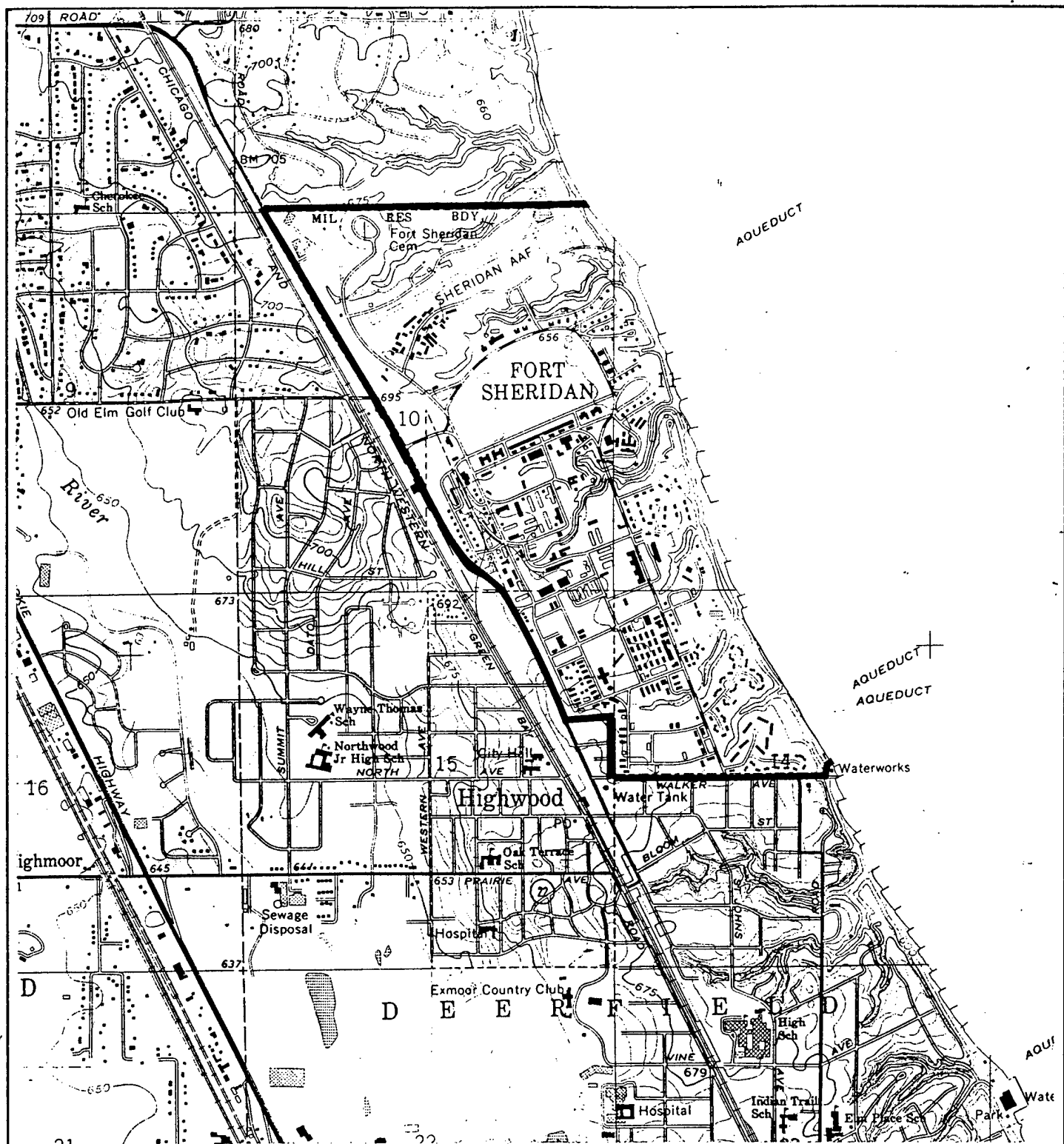
approximately 50 ft-bgs in the soil boring for LF1MW03D, and the artesian wells on the beach below Landfill 7 (GEA 6). Only four wells/soil borings extend below 70 ft-bgs. Sixteen borings extend to at least 49 ft-bgs. These borings are widely distributed across the site and provide a good representation of the hydrogeology to this depth. Of 91 well/soil borings and 49 test pits completed at Fort Sheridan, only the saturated interval in LF1MW03D and possibly the interval screened by the wells on the beach in GEA 6 exhibit the potential to be classified as Class I groundwater resources. On this basis, it is concluded that there are no Class I groundwater resources in the GEAs shallower than 49 ft-bgs. Therefore, these GEAs, without exception, can be classified as Class II groundwater resource. Given the size and representative nature of the database describing the hydrogeology at Fort Sheridan, the Class II groundwater resource designation above 49 ft-bgs can reasonably and defensibly be extrapolated to areas where there are no data or where the database is not as extensive to this depth.

Therefore, it is concluded, based on the data collected and evaluated from the GEAs, the groundwater resources under Fort Sheridan, shallower than 49 ft-bgs, are Class II groundwater resources. However, if contradictory information becomes available either through ongoing RI activities or other sources, the designation of Class II in that area will be reevaluated by DA.

1.0 Introduction

In 1988, Fort Sheridan, Illinois was recommended to the Secretary of Defense for closure by the Commission on Base Realignment and Closure (BRAC). To support decisions regarding preparation of the property for release, the Department of the Army (DA) is implementing environmental studies and restoration activities (if needed) before property transfer. The U.S. Army Environmental Center (USAEC), a part of the Army staff, is assisting Fort Sheridan in this work, and this groundwater classification document was prepared through the USAEC by Environmental Science & Engineering, Inc. This environmental study is being conducted in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Superfund Amendments and Reauthorization Act (SARA), the National Contingency Plan (NCP), and are conducted in consultation with the U.S. Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA). The location of the Fort Sheridan installation is presented on Figure 1-1.

The State of Illinois has developed corresponding groundwater classes and groundwater quality standards for the protection of its groundwater resources. The classes of groundwater and their designation criteria are promulgated in the Illinois Groundwater Standards 35 Illinois Administrative Code (IAC) Part 620 Subpart B (Subpart B). The specifics of Subpart B are discussed in Section 3.2 of this document. These groundwater quality standards are potential applicable or relevant and appropriate requirements (ARARs) for Fort Sheridan. Subsequently, the classification of the shallow groundwater affects data quality objectives established in the Overall Quality Assurance Project Plan (OQAPP) (Environmental Science & Engineering, Inc. (ESE), 1995) and the handling of investigation-derived waste (IDW) in a manner protective of shallow groundwater. As such, the classification of the shallow groundwater at the installation also has a direct effect on remediation goals established for the installation. The classification of shallow groundwater at the installation is a key element in the evaluation of analytical data collected as part of the Remedial Investigation (RI), as well as the determination of potential risks in the Baseline Risk Assessment (BRA). Because it is important to determine the classification of the shallow groundwater at the installation early in the restoration process, this groundwater classification document has been prepared.



This document presents an evaluation of data pertinent to the assessment of shallow groundwater resources at Fort Sheridan. The term shallow groundwater, as it is used in this document, refers to water contained in quaternary sediments of glacial and post-glacial origin occurring at depths of less than 75 feet below ground surface (ft-bgs). The 75 ft-bgs depth includes groundwater sampled and analyzed as part of the Phase I RI. The delineation of the extent of affected environmental media at Fort Sheridan provided no indication that investigation below this depth is required. Literature is available regarding the deeper sediments and bedrock hydrogeology; however, evaluation of these zones is beyond the scope of this document, since they are unlikely to have been affected by Fort Sheridan mission activities.

The following sections summarize information collected during the Phase I RI and other activities conducted at Fort Sheridan over the past several years by ESE and other environmental consultants on behalf of the DA. Much of the data evaluated were collected during the Phase I RI activities, however, the following additional studies contain information germane to the evaluation of shallow groundwater resources beneath Fort Sheridan.

- Final Design Analysis, Sanitary Landfill Closure for Fort Sheridan, Illinois, February 1980 (Greeley and Hansen).
- Bluff Erosion Correction Study for Fort Sheridan, Illinois, December 1981 (Bernheim, Kahn, and Lozano).
- Sanitary Sewer Evaluation, Fort Sheridan, Illinois, 1984 (Zimmer Howell).
- Ongoing restoration activities at Landfill 7 (ESE, 1995).
- Ongoing restoration activities at Building 208 (USACE, 1995).
- Water supply well information from a 45-day report for a UST investigation near Building 368 (USACE, 1994).

1.1 Objective

The objectives of this document are to compile and present the pertinent data, compare these data to the criteria presented in Subpart B for classifying groundwater resources in Illinois, and ultimately, to classify the shallow groundwater resources underlying Fort Sheridan according to these criteria.

1.2 Report Format

In order to achieve the objective of this document in a logical manner, this document is organized according to, and the analysis of the data follows, an inductive reasoning process. Specifically, the problem is stated and the framework for addressing it is established in Section 1.0. The compiled data are cataloged and described in Section 2.0. An initial evaluation of the data, with respect to the groundwater classification criteria, is conducted in Section 3.0. In Section 4.0, specific areas, which at first scrutiny do not clearly fall into one of the groundwater classifications, are evaluated more rigorously such that they may be classified according to the criteria included in Subpart B. Finally, Section 5.0 presents the final evaluation of the data and the general conclusion regarding the classification of shallow groundwater resources at Fort Sheridan.

1.3 General Discussion and Classification Criteria

Subpart B provides for all groundwaters of the State of Illinois to be designated as one of the following four classes: 1) Class I - Potable Resource Groundwater; 2) Class II - General Resource Groundwater; 3) Class III - Special Resource Groundwater; and 4) Class IV - Other Groundwater. In addition, a specific area may be designated as a groundwater management zone in accordance with requirements set forth in Section 620.250 of Subpart B. The criteria for designating groundwater as one of these four classes are included in Appendix A.

2.0 Summary of Pertinent Data

To date, a number of studies have been conducted at Fort Sheridan. This section compiles and presents the pertinent data gathered from these studies concerning hydrogeological characteristics of the glacial deposits at the fort.

2.1 Phase 1 RI Data

The Phase I RI was conducted in 1991 and 1992. The purpose of the Phase I RI was to assess the nature and extent of potentially affected environmental media related to Fort Sheridan mission activities at specific study areas. During the Phase I RI, 35 study areas of potential environmental concern were investigated. Of these study areas, subsurface investigations were conducted at the following:

- ◆ Landfills - 7 sites,
- ◆ Coal storage areas - 4 sites,
- ◆ Underground storage tank areas - 3 sites,
- ◆ Vehicle and equipment storage areas - 6 sites,
- ◆ Miscellaneous yard areas - 6 sites,
- ◆ Buildings - 7 sites, and
- ◆ NIKE Missile Fueling Point - 1 site.

These investigations generated a considerable amount of information concerning the geology/hydrogeology at Fort Sheridan. Much of this information is pertinent to the classification of the shallow groundwater at the installation. This information includes soil boring/monitoring well logs, test pit logs, results of slug/baildown tests, results of physical sample analysis, and observations of monitoring wells during development sampling events. The methods by which these data were collected are summarized in the following sections.

2.1.1 Soil Borings

Phase I RI field activities included the advancement of 91 soil borings to various depths and the installation of monitoring wells in 61 of the borings.

Soil borings were advanced with a truck mounted drill rig using either 6.25- or 4.25-inch, inside diameter hollow stem augers. Soil samples were collected in advance of the augers using either a split-spoon sampler or a Laskey continuous sampler. The borings ranged in depth from approximately 10 ft-bgs to 74 ft-bgs. The majority of the borings were terminated less than 40 ft-bgs.

As the samples were collected, a detailed log of the geology encountered was compiled by a geologist/engineer. With few exceptions, the soil borings were logged continuously. When a pair of nested wells were installed, the deeper boring was advanced and logged first and the screened interval for the shallower well was selected based on the log of the deeper borehole. In some instances, a soil boring was advanced at a location and a monitoring well was subsequently installed within a few feet of the original soil boring. In this case, the log of the original soil boring was often used to select the screened interval for the well. The following information is included on the boring logs:

- ◆ soil description according to the Unified Soil Classification System (USCS),
- ◆ percentages of primary and secondary components,
- ◆ soil color according to Munsell color charts,
- ◆ degree of plasticity,
- ◆ consistency (cohesive soils),
- ◆ moisture content,
- ◆ texture/fabric/bedding/orientation, and
- ◆ ancillary information (e.g. depositional environment, formation, and field screening values).

The soil boring logs/monitoring well diagrams are included in Appendix B. Soil boring (SB)/monitoring well (MW) locations are depicted in Plate 1. By convention in this document, each location where a monitoring well was installed is referred to as MW and the SB designation is dropped. In the cases where a monitoring well was installed next to a previously completed soil boring, only the MW location is depicted since the locations are generally close enough to be considered coincident.

2.1.2 Test Pits

A total of 46 test pits were excavated with a backhoe. These test pits were excavated to 14.5 ft-bgs or less. The locations of the test pits are depicted on Plate 1. These test pits

provided a visual cross-section of the various soils encountered. The soils were logged by a geologist/engineer during the excavation. The same information recorded for soil samples collected from soil borings was also recorded for the test pit samples. Test pit logs are included in Appendix B.

2.1.3 Physical Sample Analysis

A total of 74 soil samples from 38 soil borings were submitted to ESE's Gainesville, Florida laboratory for physical soils analysis. The moisture content (% moisture), grain size distribution (by sieve analysis), and Atterberg limits (liquid and plastic limits) were determined for each sample. These data were used to evaluate the field soil descriptions included on the boring logs. If necessary, the field descriptions were corrected based on the laboratory data and feedback was provided to the field geologist/engineer. A table summarizing the physical analysis data and the plots of the sieve analyses, for non-clay soils, are included in Appendix C. The table also provides some summary statistics for the grain size distribution analysis by soil type (i.e., USCS designation).

A soil's grain size distribution is directly related to its hydraulic conductivity (K). There are a number of published methods for estimating hydraulic conductivity from grain size distribution curves. Based on comparison of the results of these methods with hydraulic conductivities calculated using data obtained from slug/baildown tests conducted at Fort Sheridan and the assumptions inherent to these methods, a method by Kruger, Justin and Hinds was chosen to estimate hydraulic conductivity for the Fort Sheridan samples (NGWA, 1993). This method is discussed in Appendix C.

The K of a sample can only be estimated using the Kruger, Justin, and Hinds method if the grain size at which 80% of the material is retained is known. Because the grain size distribution was determined by sieve analysis and the fines were not differentiated by hydrometer, (i.e., % clay and % silt) this value is not known for samples with over 20% fines, consequently, K could not be estimated for these samples.

2.1.4 Slug Tests/Baildown Tests

Slug tests/baildown tests were performed in nine monitoring wells to evaluate the hydraulic conductivity of the geologic material screened in each of the wells. Slug tests were performed in monitoring wells LF2MW06S, LF7MW04S, B125MW01B and

LF6MW04D. Baildown tests were performed in LF2MW08D, LF5MW04S, LF6MW04S, B208MW07, and B208MW06.

A discussion of the field methods, theory of slug/baildown tests, time/water level measurements, analysis of the data, and the results of the analyses are included in Appendix D. The hydraulic conductivity values are summarized in the table below:

Table 2-1 Summary of Hydraulic Conductivity Results

Well Identification Number	Hydraulic Conductivity K (ft/min)	Hydraulic Conductivity K (cm/sec)
B125MW01B	7.0×10^{-5}	3.6×10^{-5}
LF6MW04D	3.3×10^{-6}	1.7×10^{-6}
LF2MW06S	2.4×10^{-2}	1.2×10^{-2}
LF7MW04S	2.5×10^{-3}	1.3×10^{-3}
B208MW06	5.8×10^{-7}	3.0×10^{-7}
B208MW07	3.7×10^{-6}	1.9×10^{-6}
LF5MW04S	2.7×10^{-6}	1.4×10^{-6}
LF6MW04S	8.5×10^{-5}	4.3×10^{-5}
LF2MW08D	6.6×10^{-6}	3.4×10^{-6}

2.1.5 Observations from Monitoring Well Development and Groundwater Sampling Events

Subsequent to their installation and prior to sampling, each of the monitoring wells installed during the Phase I RI at Fort Sheridan was developed by removing a minimum

of five borehole volumes of water from the well. This was accomplished with either a bailer or small submersible pump. The wells were developed to establish a good hydraulic connection between the well and the formation, and to remove as much of the fine-grained material as possible from the formation around the well to ensure that groundwater samples are as sediment free as possible.

At least one round of groundwater samples has been collected for laboratory analysis from each of the Phase I RI monitoring wells. Sampling protocol specifies that, prior to sample collection, a minimum of three casing volumes of water is to be purged from each well, or the well is to be purged dry. In most cases, the presample purging was performed with a small submersible pump. The majority of the wells at Fort Sheridan were dewatered prior to removing the required three casing volumes. When this occurred, groundwater levels in the well were monitored and the samples were collected as soon as sufficient water collected in the well. Sampling and development records include relative recovery times of specific wells. The recovery times provide information concerning the potential well yield.

2.2 Additional Investigations

In addition to the Phase I RI, several other studies have been conducted at Fort Sheridan. These studies also contain specific information concerning the geology/hydrogeology at Fort Sheridan. These studies varied in scope from installation-wide to limited areas of investigation around landfills and/or buildings. Information from these additional studies germane to the evaluation of the shallow groundwater resources beneath Fort Sheridan includes:

- Boring logs, piezometer construction details, boring/well location maps, cross-sections, and grain size distribution curves from a bluff erosion correction study conducted near Landfill 7 (Bernheim et al, 1981). These data are included in Appendix E.
- Interpretive groundwater elevation contours based on potentiometric data from a previous study of infiltration to Fort Sheridan's sanitary sewer system (Zimmer Howell, 1985). Pertinent information from this document is included in Appendix F.

- Boring logs, well point installation logs, test pit logs, and permeability test results from a final design analysis study conducted in the area around Landfills 6 and 7 (Greeley-Hansen, 1980). These data are included in Appendix G.
- Soil boring logs from an ongoing landfill closure study at Landfill 7 (ESE, 1995).
- Soil borings from an ongoing Underground Storage Tank (UST) study near Building 208 (USACE, 1995) (Appendix E).
- Water supply well information from a 45-Day report prepared for a UST investigation at Building 384 (USACE, 1994) (Appendix H).

3.0 Preliminary Data Evaluation

This section presents a preliminary evaluation of data collected during the Phase I RI at Fort Sheridan and additional information gathered during other projects at Fort Sheridan. The data collected during other investigations and projects provide information about areas of the installation not investigated as part of the Phase I RI.

3.1 Groundwater Evaluation Areas

The Phase I RI data are focused around study areas identified during the RI process as being of known or potential environmental concern. As previously stated, the purpose of this document is to evaluate the hydrogeology of the entire installation to permit a classification of the shallow groundwater resources.

To facilitate this evaluation, data from Phase I RI study areas have been grouped to provide a broad perspective and comprehensive view of the hydrogeology at Fort Sheridan, and to facilitate organized management of the large quantities of data. The grouping of RI study areas is based on their physical proximity; however, in some cases, proximal sites are grouped separately to facilitate the management of the data. Six areas have been established, referred to as *Groundwater Evaluation Areas (GEAs)*, solely for the purpose of evaluating the hydrogeology at the installation. The boundaries of the six GEAs are indicated on Plate I and may or may not correspond to the boundaries of the Phase I RI study areas.

The following general statements can be made based on the Phase I RI data:

- The predominant soil type at the installation is a lean clay described under the USCS as a CL soil. Fat clays are described under the USCS as a CH soil. Grain size distribution analysis (sieve analysis) was performed on 72 soil samples collected during soil boring/test pit advancement. The types of soils analyzed and numbers of each type analyzed were generally representative of the soils encountered in the soil borings and test pits. For the 60 samples described as USCS CL or CH soils, sieve analysis data indicate they are, on average, composed of more than 85 percent fines (i.e., material that will pass a

#200 mesh sieve). The sieve and other physical analysis data are compiled in Appendix C along with a table showing the summary statistics by soil type.

- Of the nine K tests performed, seven of them were in wells screening primarily CL or CH soils. The K values were calculated with a commercial software program called AQTESOLV™. The geometric mean of the K values from these seven wells is 3.6×10^{-6} cm/sec. A geometric mean was used as an average for the K values because these types of data are known to be log normally distributed, not normally distributed as assumed by a simple arithmetic mean. Thus, a geometric mean is a more accurate representation of the average value for these data. The hydraulic conductivity data (e.g. discussion of methodology, input parameters, and AQTESOLV plots) are included in Appendix D, as is a brief description of the calculation of the geometric mean. The two wells, LF2MW06S and LF7MW04S, with calculated hydraulic conductivity values greater than 1×10^{-4} cm/sec were completed in soils or fill material not described as CL or CH at depths less than 10 feet bgs.

The following sections discuss the data from each of the GEAs.

3.1.1 GEA 1

GEA 1 is located near the northwest corner of the installation as indicated on Plate 1. Data collected from the Landfill 1, Missile Fueling Point (MFP), and Building 126 Phase I RI study areas were used to evaluate GEA 1. Six soil borings were advanced at Landfill 1; four of these were converted to monitoring wells. One monitoring well and two test pits were advanced at both the MFP, and Building 126. The locations of the soil borings, monitoring wells, and test pits are indicated on Plate 1.

A review of the data available for this GEA revealed the following:

- Eight of the 12 soil borings included in GEA 1 encountered only soils described as lean or fat clay (i.e., CL or CH) (Appendix B). Soil

borings that encountered soils other than CL or CH soils are LF1MW01, LF1MW02, LF1MW03 and LF1MW04.

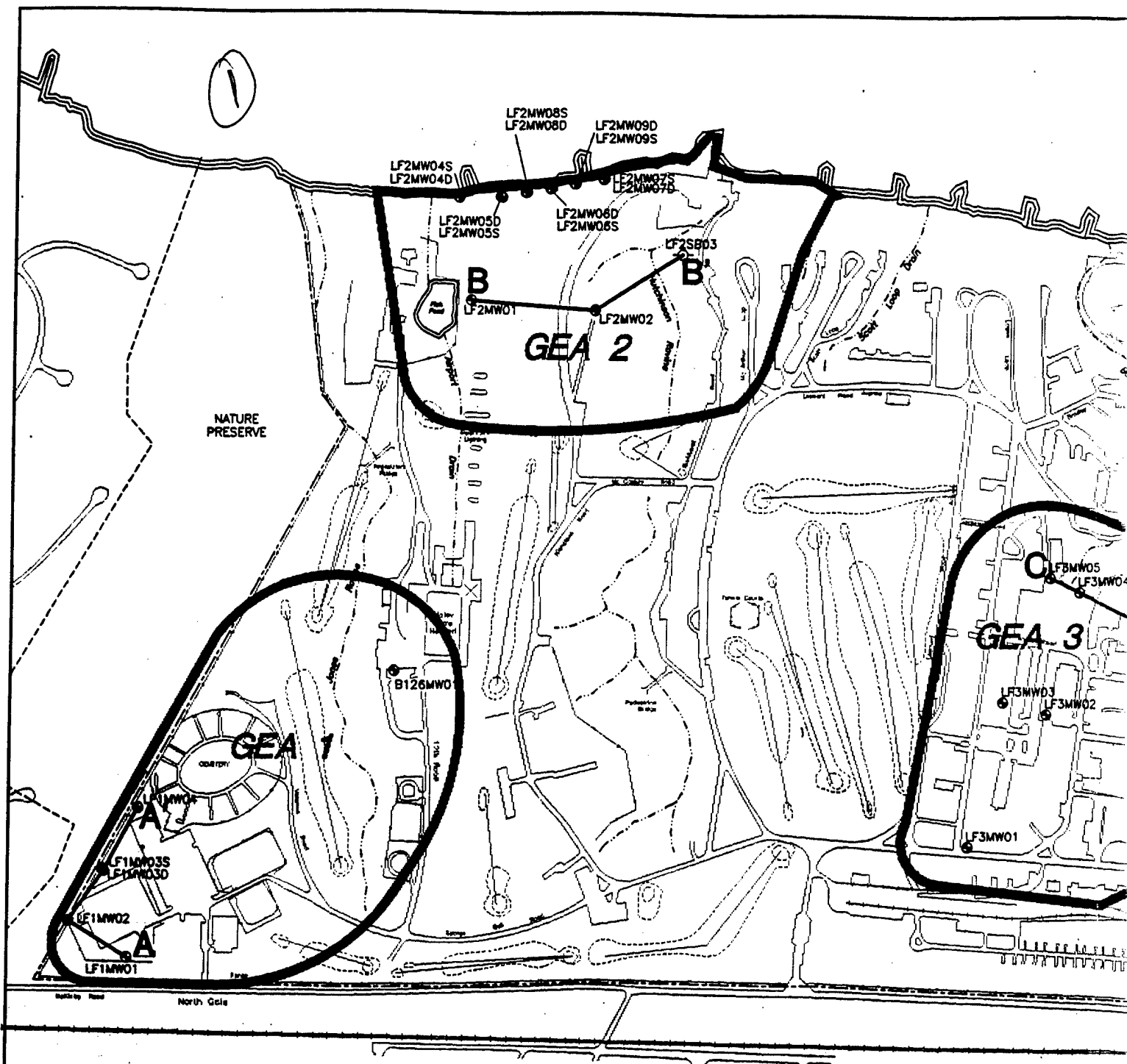
- The boring logs for LF1MW01, LF1MW02 and LF1MW04 indicate the presence of a saturated gravelly sand (SP) interval located at approximately 30 ft-bgs within the predominant clay. The thickness of the saturated interval is 6, 4, and at least 3.5 feet in LF1MW01, LF1MW02 and LF1MW04, respectively. Grain size analyses of soil samples from this interval at LF1MW01, LF1MW02 and LF1MW04 indicate that 16, 7, and 21 percent of the material passes a #200 mesh sieve, respectively. An arithmetic mean of these three values (15%) is considered to be more representative of this interval than any of the values individually considering the potential for lateral variability within a deposit. A 6-inch thick gravelly sand interval was encountered at 19 ft-bgs in LF1MW04. This interval contains 21% fines and is not present in other borings in this area. Sieve analysis data, sample depth, the USCS soil classification, moisture content, and Atterberg limits for the 72 soil samples collected at Ft. Sheridan are presented in Appendix C.
- Monitoring wells at Building 126 and the MFP extend to 26 and 36 ft-bgs, respectively. The soil borings associated with these wells encountered only soils described as CL (Appendix B). MFPSB01 extends to a depth stratigraphically equivalent to the saturated zone observed in LF1MW02 and LF1MW01 (Plate 2).
- Monitoring well LF1MW03D is set with the top of the screen more than 10 feet below the total depth of LF1MW01, LF1MW02, and LF1MW04. The soil log for this well indicates some thin, intercalated saturated gravelly sand and clay intervals between 46 and 50 ft-bgs. The boring was terminated in a silty, gravelly sand (SW) that was observed from 51 to 56 ft-bgs (Appendix B). The thickness of this interval was not defined. Sieve analysis data for a soil sample from this interval indicates that 9 percent of the material passes a #200 mesh sieve (Appendix C).

- Field notes from a groundwater sampling episode on July 14, 1991 indicate that LF1MW01 went dry during purging after being pumped for 20 minutes at less than one gallon per minute (gpm). This phenomenon was also observed during subsequent purging events.
- Field notes from March 22, 1991 indicate that LF1MW04 went dry after being pumped for 10 minutes at approximately one gpm. This phenomenon was also observed during subsequent purging events.

Several cross sections have been constructed to show the stratigraphic correlation, or more correctly, lack of stratigraphic correlation among the more permeable intervals encountered in the soil borings. The locations of the various cross-sections are shown in Figure 3-1. The stratigraphic relationship of the soils encountered in select soil borings from GEA 1 is illustrated in cross-section A - A' included on Plate 2. Although the silty sand intervals encountered in LF1MW01, LF1MW02 and LF1MW04 occur at stratigraphically equivalent elevations, no graphical correlation was made because it was the vertical exaggeration inherent to the cross section overstated the potential for these intervals to be hydraulically connected given the other information available (e.g. low yields from LF1MW01 and LF1MW04). Cross-section A - A' also shows the stratigraphic relationship of the geology observed at GEA 2 (B - B') to that observed at GEA 1. The cross section A - A' indicates that the saturated interval encountered in LF1MW01, LF1MW02 and LF1MW04 at approximately 30 ft-bgs should outcrop on the surface between GEA 1 and GEA 2, if it is a continuous linear feature (i.e., relict stream channel). This indicates that it is not in hydraulic communication with, and thus does not receive recharge from, Lake Michigan. The lack of recharge from Lake Michigan implies that it must rely on recharge from the clay which encompasses it and so its long term yield would be restricted by the inability of the clay to transmit water.

3.1.2 GEA 2

Data collected from the Landfill 2 study area, located near the northeast corner of the installation, were used to evaluate GEA 1. The location of GEA 2 is indicated on Plate 1. Soil borings were advanced at 15 locations around the perimeter of Landfill 2 and 14 of the borings were converted to monitoring wells. Monitoring well and soil boring locations are indicated on Plate 1.



● Monitoring Well Location

⊕ Soil Boring Location

— GEA Boundary



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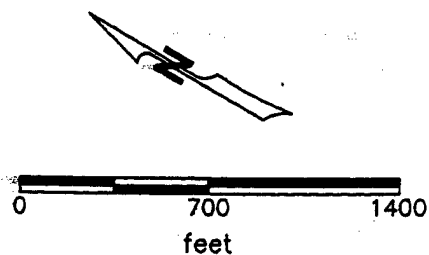
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FS2GWXS2

Adapted from Official Post Map, Directorate of Engineering and Housing, Fort Sheridan, Illinois, January 6, 1989

2



3-5

A review of the data available for this GEA revealed the following:

- Only two of the 15 soil borings advanced around Landfill 2 encountered soil below 10 ft-bgs that was described as other than CL or CH under the USCS system (Appendix B). As stated previously, CL and CH soils at Fort Sheridan average more than 85 percent fines, and hydraulic conductivity values of 3.6×10^{-6} cm/sec (Appendices C and D, respectively).
- The boring log for LF2MW02 indicates the presence of poorly graded sand intervals (SP) intercalated with the predominant CL and CH soils (Appendix B). Monitoring well LF2MW02 is screened from 15 to 25 ft-bgs. The saturated intervals, none of which exceed three feet in thickness, were encountered between 16 and 24 ft-bgs. The boring was terminated in clay (CL) that was observed from 24 to 25 ft-bgs. Grain size analysis of a soil sample from one of the SP intervals indicates that 6 percent of the material passes a #200 mesh sieve (Appendix C).
- Groundwater sampling notes for the groundwater sampling episode on July 12, 1991 indicate that LF2MW02 went dry after being pumped for 32 minutes at less than one gpm.
- The boring for LF2MW01 extended to 40 ft-bgs, stratigraphically below the saturated sand intervals observed in LF2MW02. This boring encountered only soils described as CL, indicating that the intercalated sandy intervals are not laterally extensive to the north.
- The soils encountered in LF2SB03 are described as CL, clayey silt (SM), and silt (ML) soils. The interval of SM soil between 9 and 22.5 ft-bgs was described as being dry to moist and exhibited a yellowish brown soil color typical of unsaturated soils. No well was set in this boring due to the unsaturated nature of the soils.

- The saturated intervals in LF2SB03 described as ML or SM, none of which exceeded one and a half feet in thickness, were encountered from 22.5 to 23, 24 to 25, 32 to 33, and 46.5 to 48 ft-bgs. The remainder of the 74 foot boring encountered only CL soils (Appendix B).
- Hydraulic conductivity tests were conducted in wells LF2MW06S and LF2MW08D. Monitoring well LF2MW06S screens a near-surface (less than 10 ft-bgs) gravelly sand (SP) beach deposit, the saturated portion of which is only 1.5 feet thick (Appendix B). The calculated hydraulic conductivity value at this location was 1.2×10^{-2} cm/sec (Appendix D). Monitoring well LF2MW08D is screened within the predominant clays from approximately 19.5 to 29.5 ft-bgs (Appendix B). The calculated hydraulic conductivity value for this well was 3.4×10^{-6} cm/sec.

The stratigraphic relationship of the soils encountered in select soil borings at GEA 2 is illustrated in cross-section B - B' on Plate 2.

3.1.3 GEA 3

GEA 3 is located near the central portion of the installation as indicated on Plate 1. Data collected from Landfills 3 and 4, Coal Storage Areas (CSAs) 2 and 3, and Vehicle and Equipment Storage (VES) Areas 1 and 2 were used to evaluate GEA 3. Five soil borings were advanced around the perimeter of Landfills 3 and 4. A monitoring well was installed in each soil boring. Two test pits were excavated at both CSA 1 and CSA 2. Three test pits were excavated at VES 1 and two at VES 2. The locations of the monitoring wells and test pits are indicated on Plate 1.

A review of the data available for this GEA revealed the following:

- Only two of the five soil borings and nine test pits advanced at this GEA encountered soil described as something other than CL (Appendix B). Soil borings for wells LF3MW04D and LF3MW05 encountered intervals described as sand (SP) and silty, clayey sand

with gravel (SW), and silty, clayey sand (SM), respectively, though all were less than 5 feet thick.

- The soil log for LF3MW04D indicates that SP-type material was encountered at 68.8 ft-bgs (Appendix B). The thickness of this sand was not defined.
- The soil boring for LF3MW05 encountered two intervals, each less than 5 feet thick, not classified as CH or CL soil. These intervals were described as SW and SM from 52 to 52.25 and 54 to 54.5 ft-bgs, respectively (Appendix B).
- The test pit logs for the CSAs and VESs indicate the presence of only CL soils to 14.5 ft-bgs except for some anthropogenic fill in the near surface (i.e., less than five ft-bgs) (Appendix B).
- The field notes for the development and presample purging of wells LF3MW04D and LF3MW05 indicate that no more than one borehole volume (approximately 25 gallons) could be removed before dewatering each well during the sampling episodes even though they were screened across the presumably more permeable zones (i.e., SP, SM, and SW).

The stratigraphic relationship of the soils encountered in select soil borings at GEA 3 is illustrated in cross-section C - C' on Plate 3.

3.1.4 GEA 4

Data collected from Landfill 5, Buildings 208 and 377, and CSA 4 were used to evaluate GEA 4. The location of GEA 4 is shown on Plate 1. Five soil borings were advanced at Landfill 5. Each of these borings was converted into a monitoring well. Eight soil borings were advanced around Building 208; a monitoring well was installed in each of these borings. Test pits were excavated from 12 to 14.5 ft-bgs at CSA 4 and Building 377. A soil boring was also completed at 26 ft-bgs near Building 377. The locations of these soil borings, monitoring wells, and test pits are depicted on Plate 1. In addition to the Phase I RI data, 13 additional boring logs (B1 through B13) are available from an

ongoing UST investigation near Building 208 (USACE, 1995). The locations of these additional borings are depicted in the figure included with the boring logs for B1- B13 in Appendix H.

A review of the data available for this GEA revealed the following:

- Four of the 14 Phase I RI soil borings and five of the test pits completed at this GEA encountered soils described as other than CL (Appendix B). Soil borings at the B208MW04, B208MW05, LF5MW02, and LF5MW04D locations encountered intervals described as other than CL or CH.
- A saturated sand interval was encountered at 13 ft-bgs in B208MW04 and from 13.5 to 14.5 ft-bgs in B208MW05. Monitoring well B208MW04 was terminated less than one foot into this sandy interval. Grain size distribution analysis of this sandy interval indicates that 44 percent of the material passes a 200 mesh sieve. Grain size analysis from B208MW05 is not available although the boring log indicates that the interval contains a greater percentage of fines than the interval observed in B208MW04. None of the Phase I RI soil borings surrounding B208MW04 encountered this interval other than B208MW05. Only four of the other Phase I RI borings were advanced to stratigraphically equivalent depths (Appendix B).
- The thickness of the silty/sandy zone was not defined in B208MW04 although it is approximately 1 foot thick in B208MW05. If it is assumed this zone is greater than 1 foot thick in B208MW04 then it appears to thin to the west where it is approximately 1 foot thick in B208MW05. This interval does not appear in monitoring wells to the north (B208MW03), east (B208MW07) and south (B208MW08) of B208MW04 all of which are deep enough to encounter it. It is also absent in B377SB01 to the west/southwest of B208MW04 (Plate 1). Based on these observations, the unit does not appear to be laterally or vertically extensive.

- Slug/Baildown test data for this GEA are only available from B208MW06 and B208MW07, which are screened in the predominant clay. These data indicate hydraulic conductivities of 3×10^{-6} and 1.9×10^{-7} cm/sec, for B208MW06 and B208MW07, respectively.
- The boring log for LF5MW02 indicates the presence of a SP interval within the predominant clay at approximately 48.5 ft-bgs. The thickness of the saturated interval is approximately three feet (Appendix B).
- The groundwater sampling notes from July 12, 1991 indicate that LF5MW02 went dry after being pumped for 38 minutes at less than one gpm.
- Monitoring well LF5MW04D extends at least 20 feet below the saturated sand observed in LF5MW02. The soils encountered in LF5MW04D were described as CL, ML and SM. The interval indicating SM soil between 22 and 32 ft-bgs was described as moist and water was observed at approximately 26 ft-bgs when the augers were allowed to stand open overnight (Appendix B). Grain size analysis of soil samples from this zone indicate that 87 percent of the material passes a #200 mesh sieve (Appendix C).
- The groundwater sampling notes for LF5MW04D from the period February 21 through 23, 1991 indicate that on February 21, the water level was at the surface. Approximately 30 gallons of water were removed from the well. On February 23, there was not enough water in the well to sample. On February 24, the water level was 20 feet below top of casing (btoc), having recovered approximately 10 feet.

The soil borings completed as part of the ongoing UST investigation at Building 208 do not contain USCS soil descriptions; however, they do not indicate the presence of any soils that would not be classified as clay (CL or CH) (Appendix H). Twelve of the thirteen borings were advanced to a depth stratigraphically equivalent to the saturated

sand interval encountered in B208MW04. None of these logs indicate that they encountered any soil type other than CL or CH.

3.1.5 GEA 5

Data collected from Building 115, 122, 125, 128, and 137, CSA1, and VES 5, 6, and 7 Phase 1 RI study areas were used to evaluate GEA 5. The location at GEA 5 is indicated on Plate 1. A total of 24 soil borings and 18 test pits were completed from between 5 and 26 ft-bgs during the Phase I RI. Monitoring wells were installed in eight of the borings. The locations of these soil borings, monitoring wells, and test pits are illustrated on Plate 1.

A review of the data available for this GEA revealed the following:

- Of the soil borings and test pits completed in this GEA, 29 were advanced to 10 ft-bgs or more (Appendix B).
- The boring logs from B122MW01 and B122MW02, indicated that fill material extended to 12 and 11 ft-bgs, respectively. The only other material encountered below 10 feet in any of the borings/test pits in GEA 5 were described as clays. These soils are classified under the USCS as CL and CH (Appendix B). Soils of this type at Fort Sheridan average 85 percent fines, and hydraulic conductivity values average 3.6×10^{-6} cm/sec.
- A slug test was performed in B125MW01B. Although this well was completed at only 7 ft-bgs, it was completed in soils with the same USCS classification code as deeper soils in GEA 5 (i.e., CL and CH). The results of this slug test indicate a hydraulic conductivity of 3.6×10^{-5} cm/sec. This calculated hydraulic conductivity value may be higher than those observed in deeper CL or CH soils due to weathering and fracturing of the soils near the surface (Greeley and Hanson, 1980).

A cross section was not constructed for GEA 5 due to the uniformity of the material encountered in the soil borings.

3.1.6 GEA 6

Data collected from the Building 368, Landfills 6 and 7, and VES 9 Phase 1 RI study areas were used to evaluate GEA 6. During the Phase I RI, 20 soil borings were advanced to between 8.5 and 74.5 ft-bgs and six test pits were excavated to between 3.5 to 14.5 ft-bgs. Monitoring wells were installed in 15 of the soil borings. Slug tests were performed in LF6MW04D, LF7MW04S, and LF6MW04S.

In addition to the Phase 1 RI, other studies have been conducted in or near GEA 6. These studies include a landfill closure study (Greeley and Hansen, 1980), a bluff erosion correction study (Bernheim et al, 1981), and ongoing restoration activities at Landfills 6 and 7 by ESE.

A review of the data available for this GEA revealed the following:

- Of the 20 soil borings in this GEA, nine encountered soil types other than clay described as CL or CH (Appendix B).
- The boring log for LF7MW02 indicates the presence of a saturated clayey gravel (GC) from 31.5 to 34 ft-bgs and a saturated sandy gravel (GP) from 34 ft-bgs to at least 40 ft-bgs. Monitoring well LF7MW02 was terminated within this interval (Appendix B).
- Soil boring LF7SB01, which is located approximately 30 feet to the south of LF7MW02, encountered only soil type CL at an elevation stratigraphically equivalent to the gravel encountered in LF7MW02 (Appendix B). LF7-SB1 was drilled as part of an ongoing restoration project at Landfill 7 and was completed at 67 ft-bgs. LF7-SB1 is located between Landfill 7 and LF7MW02 indicating that the gravelly interval encountered in LF7MW02 is not continuous in that direction (Plate 1 and Plate 3).
- LF7-SB1 was completed during the ongoing restoration activities at Landfill 7. The boring log for LF7-SB1 indicates the presence of a clayey sand (SC) at 25 ft-bgs and a silt (ML) at 49 ft-bgs. Neither of these intervals is more than two feet thick (Appendix E).

- The boring log for LF7MW01 indicates a saturated silt interval (ML) in the predominant clay till from 55 to 60 ft-bgs (Appendix E).
- Monitoring wells LF7MW04D, LF7MW05D, and LF7MW06D are or were located on the beach below Landfill 7 (Plate 1). Monitoring well LF7MW06D has been plugged and abandoned because it was damaged.
- The logs for LF7MW04D, LF7MW05D, and LF7MW06D indicate soils described as clayey silt (MH), MH and clayey sand (SC), silt (ML), sand (SP) and gravel (GP), respectively. The saturated, sand, gravel and/or silt deposits were encountered at depths greater than 25 feet below the beach level (Appendix B). None of the intervals were more than 1 foot thick, with the exception of the 2 foot thick MH interval observed between 32 and 34 ft-bgs in LF7MW04D. There is approximately 75 feet of elevational relief between these wells and those advanced in the remainder of GEA 6.
- A thin, less than 0.5 feet, sand was encountered in LF6SB03 at 34 ft-bgs (Plate 1, Appendix B). This sand lens was not encountered at similar depths in other borings advanced near Landfill 6. The sand lens appears to be of limited lateral extent and thickness.
- Slug test data from LF6MW04D, LF7MW04S and LF6MW04S indicate hydraulic conductivities of 1.7×10^{-6} , 1.3×10^{-3} and 4.3×10^{-5} cm/sec. It should be noted that LF7MW04S, which exhibits K values greater than 10×10^{-4} cm/sec, is completed at 9 ft-bgs partially in the beach sands.
- The 8-inch thick interval of SC soils in LF7MW05D encountered between 33 and 33.75 ft-bgs was determined to have 14 percent fines by sieve analysis.

The stratigraphic relationship of the soils encountered in the various soil borings is illustrated in a cross-section included as Plate 3.

3.2 Comparison of Data to Classification Criteria

As discussed previously, Subpart B of 35 IAC 620 establishes criteria for the classification of the Illinois groundwaters into four classes. These classes are: 1) Class I - Potable Resource Groundwater; 2) Class II - General Resource Groundwater; 3) Class III - Special Resource Groundwater; and 4) Class IV - Other Groundwater. A specific area may be designated as a groundwater management zone in accordance with requirements set forth in Section 620.250. These criteria are included as Appendix A.

According to Subpart B criteria, the designation of Class III - Special Resource Groundwaters and Class IV - Other Groundwaters, does not appear to be appropriate at Fort Sheridan. Specific areas may, at some point, qualify as Class IV; however, at this point in the RI/FS, this designation has not been made.

With the exclusion of Class III and IV designations, the evaluation of the data presented in this document narrows to a determination of either Class I or II eligibility. Class II - General Resource Groundwater is a catchall category incorporating those groundwaters not specifically included in the other categories. To qualify as Class I - Potable Resource Groundwater the groundwater must be:

- a) located 10 or more feet below the land surface and within:
 - 1) The minimum setback zone of a well which serves as a potable water supply and to the bottom of such well;
 - 2) unconsolidated sand, gravel, or sand and gravel which is five feet or more in thickness and that contains 12 percent or less of fines (i.e., fines which pass through a No. 200 sieve);
 - 3) sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or
- 4) any geologic material which is capable of a:
 - A) sustained groundwater yield from up to a 12-inch diameter borehole, of 150 gallons per day or more from a thickness of 15 feet or less: or
 - B) hydraulic conductivity of 1.0×10^{-4} cm/sec or greater using one of the following test methods or its equivalent:

- i) permeameter;
- ii) slug test; or
- iii) pumping test.

b) Any groundwater which is determined by the Illinois Pollution Control Board to be capable of potable use.

Note: Any portion of a thickness associated with the geologic materials as described above should be designated as Class I groundwater if located 10 feet or more below the land surface.

Several soil borings/test pits encountered coarse grained material at less than 10 ft-bgs. In particular, the wells installed on the beach at Landfills 2 and 7. Since geologic material occurring at less than 10 ft-bgs is specifically excluded from consideration as a Class I groundwater resource, soil borings that encountered coarse grained material at less than 10 ft-bgs and exhibit no other potential Class I groundwater resource material are not evaluated further. The following subsections evaluate the Fort Sheridan database in light of these criteria.

3.2.1 Criteria 1

Data available from UST investigations at Fort Sheridan indicate that there are not any water supply wells within the Fort Sheridan installation boundary (Appendix I) (USACE, 1994). The minimum setback zone for private and municipal water supply wells is 200 and 400 feet, respectively, from the well head. These distances are included in IEPA Administrative Procedure (AP) #26. A review of the 45-day report submitted for the Building 368 UST investigation revealed the following:

- Water well records were requested from the Illinois Geological Survey and the Illinois State Water Survey. The requested areas include Sections 3, 4, 9, 10, 11, 14, 15, 16, 22, 23, and 24 of R12E, T43N, Lake County, Illinois.
- The Illinois Geological Survey provided 30 well logs within a 2 mile radius of Fort Sheridan. The information provided did not indicate whether the subject water wells are still in use.

- The Illinois State Water Survey provided a Private Well Database and a PICS Database. The Private Water Well Database listed 21 wells. Eleven of the 21 wells were the same wells obtained from the Illinois Geological Survey.
- No well log records were located for wells in the PICS Database for the requested locations.
- Only six wells were located within a one half mile radius of Fort Sheridan. The average depth of these wells is greater than 300 feet. The two wells located closest to Fort Sheridan property (< 1,000 feet) are described as follows. Well #4 - installed in 1974, depth of 40 ft-bgs, (however, appears to be a soil boring log with no well installed); and Well #5 - installed in 1904, depth of 1753 ft-bgs (however, sufficient information to characterize the well is not indicated on the log).
- Neither well #4 or #5 can be characterized as residential or municipal.
- None of the monitoring wells at Fort Sheridan are within the set-back zone of these above referenced wells.
- The State of Illinois Water Survey indicates the depth to potable groundwater in the Fort Sheridan area is approximately 900 ft-bgs (Appendix I).
- All potable water at Fort Sheridan comes from Lake Michigan.

Accordingly, none of the geologic material within the Fort Sheridan boundary would qualify as a Class I groundwater resource under Criteria 1. The figure included in Appendix I depicts the locations of water supply wells within a one mile radius of the Fort Sheridan property boundary.

3.2.2 Criteria 2

Sands, gravels, and sands and gravels were observed at several locations in soil boring/test pits completed at Fort Sheridan. There are only three soil borings at Fort Sheridan that encountered a saturated interval composed of sand, gravel, or sand and gravel greater than five feet thick and containing less than 12 percent fines at depths greater than 10 feet. The following subsections summarize the hydrogeologic descriptions of these three borings.

3.2.2.1 LF1MW03D (GEA 1)

The boring log for LF1MW03 indicates the presence of an interval of SP material from 51 to 56 ft-bgs. The well terminates within the gravelly sand interval. Consequently, the overall thickness has not been determined. The boring log indicates that the interval is at least 5-feet thick. Sieve analysis data collected from within this interval indicates 9% fines. Sediments of this type (SP) may exhibit K values greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979).

3.2.2.2 LF3MW04D (GEA 3)

The boring log for LF3MW04D indicates the presence of a saturated sand (SC) from 69 ft-bgs to an undetermined depth. The boring was terminated after penetrating 1 foot into this sand interval. Sieve analysis data are not available from within this sand interval. However, sediments of this type (SC) may exhibit K values greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979).

3.2.2.3 LF7MW02 (GEA 6)

The boring log for LF7MW02 indicates the presence of an interval of gravel (GP) from 31.5 to 40 ft-bgs. The well terminates within the gravel interval. Consequently, the overall thickness has not been determined. The boring log indicates that the gravel interval is at least 8.5 feet thick. Sieve analysis data are not available from within this gravel interval. However, sediments of this type (GP) may exhibit K values greater than 1.0×10^{-4} cm/sec.

3.2.3 Criteria 3

Fort Sheridan is located in an area of glacial till that the regional literature indicates is at least of 200 feet thick (Berg, 1988). Although none of the soil borings at Fort Sheridan have extended to bedrock, the logs for water supply wells in the area indicate that 200 feet is a valid estimate of the depth to bedrock (Appendix I). Criteria 3 deals with water contained in bedrock. Consequently, none of the geologic material under consideration by this document would qualify as a Class I groundwater resource under this criteria.

3.2.4 Criteria 4

There are no permeameter or quantitative pumping test data available for any of the monitoring wells at Fort Sheridan. Slug/baildown tests have been conducted in nine wells. However, only two monitoring wells were determined through slug/baildown tests to have K values greater or equal to 1.0×10^{-4} cm/sec. Well LF7MW04S screens the beach sediments that do not extend past 10 ft-bgs. Well LF6MW04S encountered a clayey sand (SP) interval that extended from 0.5 to 4.0 ft-bgs. Both of these wells are located in GEA 6. Since geologic material less than 10 ft-bgs is specifically excluded from consideration as a Class I groundwater resource, the intervals observed at these locations will not be evaluated further. Evaluation of the boring logs at Fort Sheridan indicates that several soil borings encountered saturated intervals more than 10 ft-bgs containing soils that may be expected to exhibit K values greater than 1.0×10^{-4} cm/sec. The following subsections summarize the hydrogeologic descriptions of the intervals encountered in these borings. For efficiency, wells that are proximal to each other and encountered similar hydrogeologic conditions are grouped together.

3.2.4.1 LF1MW01 (GEA 1)

Neither pumping nor slug test data are available for LF1MW01. However, the boring log for this well indicates the presence of an interval containing sediments (SP) that may exhibit K values greater than 1.0×10^{-4} cm/sec. The boring log indicates this interval is approximately 6 feet thick, and the sediments were described as gravelly sand. Sieve analysis data indicate 16% fines in this interval.

3.2.4.2 LF1MW02 (GEA 1)

Neither quantitative pumping nor slug test data are available for well LF1MW02. However, the soil boring log for this well indicates the presence of an interval containing sediments (SP) that may exhibit K values greater than 1.0×10^{-4} cm/sec (Fetter, 1980). The boring log indicates this interval is approximately 4 feet thick, and the sediments were described as gravelly sand with clay and silt. Sieve analysis data are not available from within this sand interval. The interval was encountered between 26 and 30 ft-bgs.

3.2.4.3 LF1MW03D (GEA 1)

Neither quantitative pumping nor slug test data are available for LF1MW03D. However, the boring log for this well indicates the presence of saturated sediments (SP) that may exhibit K values greater than 1.0×10^{-4} cm/sec. The thickness of this interval was not determined during drilling; however it is at least 5 feet thick. Sieve analysis data are not available from within this sand interval. The top of the interval is 51 ft-bgs.

3.2.4.4 LF1MW04 (GEA 1)

Neither quantitative pumping nor slug test data are available for LF1MW04. However, the boring log for this well indicates the presence of an interval containing sediments (SP) that may exhibit K values greater than 1.0×10^{-4} cm/sec. This interval was encountered at 23 ft-bgs and is at least 3.5 feet thick. The sediments were described as gravelly sand with silt and clay. Sieve analysis data are not available from within this sand interval.

3.2.4.5 LF2MW02 (GEA 2)

Neither quantitative pumping nor slug test data are available for LF2MW02. However, the boring log for this well indicates the presence of sediments (SP) intercalated with the predominant clay that may exhibit K values greater than 1.0×10^{-4} cm/sec. Sieve analysis data are not available from within this sand interval. The boring log indicates the thickest interval of SP soils is approximately 3 feet thick, and the sediments were described as silty sand. The entire interval with intercalated sediments (SP) within the predominant clay extends from 16 to 24 ft-bgs.

3.2.4.6 LF3MW04D (GEA 3)

Neither qualitative pumping nor slug test data were available for LF3MW04D. However, the boring log of LF3MW04D indicates the presence of a saturated sand (SC) from 69 ft-bgs to an undetermined depth. The boring was terminated after penetrating 1 foot into this sand interval; consequently the thickness has not been determined. Sieve analysis data are not available from within this sand interval. However, sediments of this type (SC) may exhibit K values greater than 1.0×10^{-4} cm/sec.

3.2.4.7 LF3MW05 (GEA 3)

Neither quantitative pumping nor slug test data are available for LF3MW05. However, soils encountered in LF3MW05 from 52.0 - 52.25 ft-bgs and 54.0 - 54.5 ft-bgs were described as well graded and silty sands (SW and SM, respectively). The results of physical sample analysis revealed that these intervals contain 46% and 53% fines, respectively. These percentages of fines indicate that the samples should be described as silty sand (SM) and silt (ML), respectively. These types of soil may exhibit K values greater than 1.0×10^{-4} cm/sec. However, based on these descriptions and the percentage of fines, neither of these intervals are likely to yield groundwater at a sustainable usable rate.

3.2.4.8 B208MW04 and B208MW05 (GEA 4)

Neither quantitative pumping nor slug test data are available for B208MW04 or B208MW05. However, the boring log for B208MW04 indicated the presence of an interval containing sediments, described as sand (SW). Soils of this type may exhibit K values greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979). The boring log indicates that this interval is at least 1 foot thick. Consequently, the thickness of this interval is not defined. The top of the interval occurs at 13 ft-bgs. Physical sample analysis indicates this interval contains 44% fines and should be described as a clayey sand (SC), rather than the field description, sand (SW), included on the boring logs. The soil encountered in B208MW05 at 13.5-14.5 ft-bgs was described as clayey sand (SC) from 13.5 to 14.0 ft-bgs and silt (ML) from 14.0 to 14.5 ft-bgs. These types of soils may exhibit K values greater than 1.0×10^{-4} cm/sec. Because of the high percentage of fines in these intervals, they are not expected to yield groundwater at a sustainable, usable rate.

3.2.4.9 LF5MW02 (GEA 4)

Neither quantitative pumping nor slug test data are available for well LF5MW02. However, the boring log for this well indicated the presence of an interval containing sandy sediments (SP) that may exhibit K values greater than 1.0×10^{-4} cm/sec. Sieve analysis data are not available from within this sand interval. The boring log indicates this interval is approximately 3 feet thick, and extends from 48.5 feet to about 51 ft-bgs. Sediments of this type may be expected to transmit water at a usable rate; however, it is considered unlikely that this rate would be sustainable.

3.2.4.10 LF5MW04D (GEA 4)

Neither quantitative pumping nor slug test data are available for LF5MW04D. However, soils encountered more than 10 ft-bgs in LF5MW04D were described as silt (SM). This silt interval was encountered from 22.0 to 32.0 ft-bgs. Sieve analysis of a sample from this interval indicated 87% fines. Soils of this type (SM) and percentage fines, generally do not exhibit K values greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979), nor are they expected to yield water at a sustainable, usable rate.

3.2.4.11 LF7MW02 (GEA 6)

Neither quantitative pumping nor slug test data are available for LF7MW02. However, the boring log for this well indicates the presence of saturated gravel sediments (GP) that may exhibit K values greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979).

3.2.4.12 LF7MW04D, LF7MW05D, LF7MW06D (GEA 6)

Neither quantitative pumping nor slug test data are available for wells LF7MW04D, LF7MW05D, or LF7MW06D; however, the borings for these three wells encountered thin intervals of soil described as clayey silt (MH), clayey sand (SC), sand (SP), and gravel (GP). The occurrence of each of these intervals in the individual wells is indicated on the boring logs in Appendix B. The thickest of these intervals (MH) is in LF7MW04D between 32 and 34 ft-bgs. The other intervals are all less than 1 foot thick. None of the intervals are at stratigraphically equivalent elevations, implying that they are not laterally extensive. Soils with descriptions such as SC, SP, and GP may exhibit K values greater than 1.0×10^{-4} cm/sec. LF7MW04D and LF7MW05D are artesian with

observed flows at the surface of less than 0.25 gpm. These wells have been artesian since shortly after their installation indicating that these low flows are sustainable.

3.3 Summary

With the exception of intervals at the fifteen locations identified above, none of the geologic materials have exhibited the potential to be classified as a Class I groundwater resource. These excepted intervals potentially meet at least one of the criteria of a Class I groundwater resource and are summarized in Table 3-1. The data are evaluated further to determine if they are indeed Class I groundwater resources of the type intended for protection under Subpart B in Section 4.0.

TABLE 3-1
Potential Class I Groundwater Resource Intervals

GEA	Well I.D.	Criteria 1	Criteria 2*		Criteria 3	Criteria 4	
		Within the Minimum Set Back Zone (≤ 400 feet)	Unconsolidated Sand and/or Gravel Interval (≥ 5 feet thick)**	<12% FINES***	Sandstone or Fractured Carbonate Bedrock	Sustainable Groundwater Yield (≥ 150 gpd)	Hydraulic Conductivity ($\geq 1.0 \times 10^{-3}$ cm/sec)
GEA 1	LF1MW01	N	Y (33-39)	N	N	N	****1.8 x 10 ⁻³
	LF1MW02	N	N	Y (7)	N	ND	ND
	LF1MW03D	N	Y (51-256)	Y (9)	N	ND	****8.9 x 10 ⁻³
	LF1MW04	N	ND (23-26.5)	N	N	N	ND
GEA 2	LF2MW02	N	N	Y (6)	N	N	****6.5 x 10 ⁻³
GEA 3	LF3MW04D	N	ND (68.8-269)	ND	N	N	ND
	LF3MW05	N	N	N	N	N	ND
GEA 4	B208MW04	N	ND (13-214)	N	N	N	ND
	B208MW05	N	N	ND	N	N	ND
	LF5MW02	N	N	N	N	N	ND
	LF5MW04D	N	N	N	N	N	ND
GEA 5	NONE	--	--	--	--	--	--
GEA 6	LF7MW02	N	Y (31.5-240)	ND	N	N	ND
	LF7MW04D	N	N	N	N	ND	ND
	LF7MW05D	N	N	N	N	ND	****3.0 x 10 ⁻³
	LF7MW06D	N	N	N	N	ND	ND

ND = Not Determined N = No Y = Yes cm/sec = centimeters per second gpd = gallons per day

* = in order to meet criteria 2, both aspects must be answered yes

** = depth of sand and gravel interval is shown in feet below ground surface

*** = percentage of fines indicated in parentheses

**** = Estimated from grain size distribution data (Krugger, Justin and Hinds Method)

4.0 Enhanced Data Evaluation

In the previous section (3.2), saturated soil intervals that potentially met at least one of the criteria for a Class I groundwater resource were identified at fifteen locations. Of the 91 wells/soil borings and 49 test pits completed as part of the Phase I RI, these fifteen wells represent the only investigated locations at Fort Sheridan exhibiting the potential to be classified as Class I groundwater resources. None of the other evaluated areas meet any of the criteria for a Class I groundwater resource under Subpart B. Therefore, by default, these other areas should be classified as Class II groundwater resources.

Discussions with the Illinois Environmental Protection Agency's Groundwater Assistance Unit Staff (Mary 1-2, Springfield, Illinois) regarding the classification of groundwater under Subpart B, and the intent of the regulation, have indicated the following:

- Subpart B is designed to protect viable, sustainable underground sources of drinking water.
- In order to be considered sustainable, a source of groundwater must be able to yield, without damage to the formation, water at approximately 10 gpm. This is the rate required by most single unit private water supplies.
- Dewatering of the formation would be expected to result in damage to the formation and a decrease in its ability to yield water.
- A small discontinuous deposit of sand and/or gravel that is incapable of sustaining a yield of 150 gpd at approximately 10 gpm may not be considered a Class I groundwater resource, even if the interval itself exhibits a hydraulic conductivity of greater than 1.0×10^{-4} cm/sec. This statement recognized that a discontinuous sand or gravel may itself, be capable of transmitting water at the required rate; however, due to its discontinuous nature, the fine grained matrix that encapsulates it will limit the amount of water available.

The intervals at the well locations identified in Section 3.2 as potential Class I groundwater resources, by virtue of their having met or having the potential to meet at least one of the Subpart B Class I criteria, are evaluated below in light of the above items.

4.1 Geologic Setting

The extent to which potential Class I groundwater resources truly represent sustainable sources of groundwater must be evaluated in the context of the geologic setting of Fort Sheridan and of northern Illinois. Fort Sheridan is located within the Lake Border Morainic System of the Central Lowlands Physiographic Province. This system consists of five long, narrow, closely spaced moraines that run generally parallel to the Lake Michigan shoreline. The moraines consist of unconsolidated glacial till of Pleistocene Age, deposited during the Wisconsin glacialiation. Fort Sheridan is located along the Lake Michigan shoreline on the Highland Park Moraine, the easternmost moraine in southern Lake County, Illinois (Atwood et al, 1908).

The topography at Fort Sheridan is relatively flat, with a gentle slope of 2 to 4 degrees to the east, terminating at a bluff line running along the lakeshore. The top of the bluff ranges from 39 to 69 feet above the Lake Michigan level. Lake Michigan elevation is approximately 581 feet above mean sea level (E.C. Jordan, 1990).

The Pleistocene glacial deposits at Fort Sheridan are approximately 200 feet thick. The deposits, associated with the silty clay phase of the Wadsworth Till Member of the Wedron Formation, are composed of a matrix of silt and clay in which sand, gravel, and cobbles are embedded. The upper 50-plus feet is a silty clay, while the lower units are described as a clayey silt with discontinuous fine sand and silt lenses. Sporadic boulders may also be present. The till is yellow to olive brown in the upper 1- to 15-foot oxidized zone, and gray below the water table. Permeability of the glacial deposits at Fort Sheridan is relatively low due to its high clay content. Laboratory analysis of silty clay samples indicates K values range from 1×10^{-8} to 1.2×10^{-7} cm/sec (Bretz, 1939 and 1955). These K values are approximately an order of magnitude lower than those measured in silty clay in the field at Fort Sheridan. The difference between K values from the field and the laboratory is a commonly observed phenomenon. Hydraulic conductivity is a scale dependant parameter whose value tends to increase as the volume of material tested increases.

The groundwater table is encountered within the till at depths up to 15 ft-bgs at Fort Sheridan. Groundwater exists under unconfined conditions, but due to the impermeable nature of the till, may be locally perched. Limited groundwater elevation data are available from a installation-wide piezometer network installed in 1984 as part of a sanitary sewer investigation (Zimmer Howell Engineering, Ltd, 1984). The data indicate that regional groundwater flow is to the northeast toward Lake Michigan; however, in the vicinity of the ravines, shallow groundwater flow tends toward the ravine.

Fort Sheridan and neighboring cities and towns obtain drinking water from Lake Michigan. The nearest town using groundwater as a municipal water supply is Lincolnshire, approximately 5 miles southwest of Fort Sheridan.

The installation specific data corroborate the description of the geologic setting. The lenticular, discontinuous nature of silt, sand, and gravel lenses within the till suggested by the literature is confirmed by the site specific data. These lenses are observed in the soil borings as the silt, sand, and gravel intervals that were sporadically encountered during completion of the soil borings. Borings which encountered these silt, sand and gravel intervals are grouped together in the following sections, based on their similar hydrogeologic conditions and geographic proximity.

4.2 LF1MW01, LF1MW02, and LF1MW04 (GEA 1)

Boring logs for LF1MW01, LF1MW02 and LF1MW04 indicate the presence of a sandy (SP) interval within the predominant clay at a depth of approximately 30 ft-bgs. The thickness of the saturated interval ranges between four and six feet in these wells. Grain size analysis for soil samples from this interval indicate that, on average, 15 percent of the material passes a #200 mesh sieve. Using the Kruger, Justin and Hinds method, a K value of 1.8×10^{-3} cm/sec was estimated using grain size distribution data from this interval in LF1MW01 (i.e., 16 percent fines) (Appendix C). This information indicates that this interval has the potential to be classified as a Class I groundwater resource under Criteria 4.

Observations recorded during groundwater sampling events indicate that, although this interval has the potential to exhibit a measured K value of greater than 1.0×10^{-4} cm/sec, it is not capable of yielding water at a usable rate. The field notes indicate that on July 14, 1991, LF1MW01 went dry during purging after being pumped for 20 minutes at less than

one gpm. Monitoring well LF1MW04 also went dry after being pumped for 10 minutes at approximately one gpm on March 22, 1991 and during subsequent sampling events. However, the field notes indicate that LF1MW02 was not pumped dry at a rate of approximately one gpm, although the water level dropped significantly. While the well was not pumped completely dry, the pump, which was set at the bottom of the well, began to suck air after approximately 35 gallons were removed. While the sandy material in this interval may be capable of transmitting water at a usable rate, the clay that encapsulates the sandy material is not and, therefore, limits the water available from the interval. This interval clearly is not capable of sustainably yielding groundwater at a usable rate and therefore, should not qualify as a Class I groundwater resource.

4.3 LF1MW03D (GEA 1)

This well is screened in a gravelly sand (SP) interval that is at least five feet thick and contains 9 percent fines (Appendix B and C). The top of this interval is 51 ft-bgs, and the thickness is undetermined. The top of this interval is 29 feet below the base of the fill material in Landfill 1. Hydraulic conductivity data from slug tests are not available. However, using the Kruger, Justin and Hinds method, a K value of 8.9×10^{-3} cm/sec was estimated from grain size distribution data for this gravelly sand interval (Appendix C).

The field notes taken during the development of this well indicate that the water level prior to pumping was approximately 40 feet below top of casing (ft-btoc). The well was developed by removing 168 gallons of water over a nine hour period without dewatering the well. The actual pumping time was approximately 137 minutes. This equates to an average pumping rate of approximately 1.2 gpm. Over 100 gallons of water were removed from this well several times during its development and presample purging.

Although it is not clear from this information if the gravelly sand interval is able to yield water sustainably at 10 gpm, it is clear that the interval is yielding groundwater to the well at a rate of at least 150 gpd. It is not clear whether the water is only being removed from storage in the interval. If this is the case, the yield would not be sustainable over time. Based on the available data, this interval may represent a Class I groundwater resource. Due to a lack of wells/borings in the area of LF1MW03D, the lateral extent of this potential Class I groundwater resource cannot be accurately determined. However, the nature of the geology at Fort Sheridan indicates that it is at best a linear feature such as an old stream channel and is not likely to be areally extensive.

4.4 LF2MW02 (GEA 2)

The boring log for LF2MW02 indicates the presence of intercalated saturated sand (SP) and the predominant clay. The saturated intervals are located between 16 and 24 feet-bgs. While none of the intervals by themselves is 5-feet thick, the total thickness of intercalated sands is approximately 5 feet. Grain size analysis of soil samples from one of these sandy intervals indicates that 6 percent of the material passes a #200 mesh sieve.

Using the Kruger, Justin and Hinds method, a K value of 6.5×10^{-3} cm/sec was estimated from grain size distribution data, indicating that this interval might qualify as a Class I groundwater resource under Criteria 4. However, as discussed previously, based on observations during sampling events, LF2MW02 goes dry when pumped for relatively short periods of time at less than one gpm. This indicates that the SP interval will not sustainably yield water at a usable rate and, therefore, should not qualify as a Class I groundwater resource.

4.5 LF3MW04D (GEA 3)

The boring log for LF3MW04D indicates the presence of a saturated sand (SC) from 69 ft-bgs to an undetermined depth. The boring was terminated after penetrating 1 foot into this sand interval. The boring log indicates this interval is at least 1 foot thick. Sieve analysis data are not available from within this sand interval. This information indicates that this interval has the potential to be classified as a Class I groundwater resource under Criteria 2 and/or 4. Specifically, this interval may be greater than 5 feet in thickness and contain less than 12% fines. In addition, the soils in this interval have the potential to exhibit K values greater than 1.0×10^{-4} cm/sec.

The equilibrium water level in this well averages approximately 26 feet btoc. The well development and sampling notes for LF3MW04D indicate that no more than 40 gallons of water could be removed from the well at any time. On July 9, 1991, the well was pumped dry. The well was not completely dewatered on other purging episodes due to the presence of silt in the bottom of the well. However, on April 2, 1991, the water level dropped to 67.62 feet btoc and had not recovered at all 24 hours later. In March 1991, the well was purged and the water level after purging was 67.77 feet btoc. Five days later it had recovered to 60.17 feet btoc. While the sandy material in this interval may be capable of transmitting water at a usable rate, the clay that encapsulates the sandy material is not and, therefore, limits the water available in the interval. This interval is

clearly not capable of sustainably yielding groundwater at a usable rate and, therefore, should not qualify as a Class I groundwater resource.

4.6 LF3MW05 (GEA 3)

Soils encountered in LF3MW05 from 52.0 - 52.25 ft-bgs and 54.0 - 54.5 ft-bgs were described as well graded and silty sands (SW and SM, respectively). The results of physical sample analysis revealed that these intervals contain 46% and 53% fines, respectively. These percentages of fines indicate that the samples should be described as silty sand (SM) and silt (ML), respectively. Based on these descriptions and the percentage of fines, as determined by sieve analysis, these intervals may exhibit a K of greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979). The equilibrium water level in this well averages approximately 20 feet btoc. The well development and sampling notes for LF3MW05 indicate that, before going dry, no more than 35 gallons of water could be removed from the well at any time. Subsequent to these dry purgings, which occurred six times from February 1991 to July 1991, water levels dropped to more than 40 feet btoc. Approximately 10 days were required for the well to recover to within eight feet of the original water level. The slow recovery rate and repeated dry purgings indicate that this interval material will not provide a sustainable usable groundwater yield and should not qualify as a Class I groundwater resource.

4.7 LF5MW02 (GEA 4)

The boring log for LF5MW02 indicates a sand (SP) interval within the predominant clay at approximately 48.5 feet-bgs. The thickness of the saturated interval is approximately three feet. Slug test and grain size analysis data are not available for this saturated interval. However, soils of this type may exhibit K values of greater than 1.0×10^{-4} cm/sec. Based on Phase I RI field notes, LF5MW02 was pumped at 0.7 gpm for 38 minutes before going dry on March 24, 1991. This occurred repeatedly during the development and presample purging of the well. Repeated dewatering of the well indicates that the saturated interval will not sustainably yield water at a usable rate and, therefore, should not qualify as a Class I groundwater resource.

4.8 B208MW04 and B208MW05 (GEA 4)

The boring log for B208MW04 indicates a saturated sand (SW) interval from 13 ft-bgs to an undetermined depth at this location. Typically SW soils exhibit hydraulic conductivity values greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979). Based on these data, this interval might be classified as a Class I groundwater resource, according to Criteria 2 and/or 4. However, the geology observed in wells around the perimeter of the Building 208 study area indicates that this interval is not laterally extensive. The boring log for B208MW05, located approximately 150 feet west of B208MW04, indicates a 1 foot thick saturated interval described as clayey sand (SC) and silt (ML). The depth of this interval is stratigraphically equivalent to the SW soils encountered in B208MW04 (Appendix B).

Additional information from boring logs of perimeter wells B208MW06, B208MW07, B377SB01 and test pits CSA4TP1 and CSA4TP2 confirm that the intervals observed in B208MW04 and B208MW05 are not laterally extensive (Appendix B). The boring logs (B1-B13) from the UST investigation at Building 208 also support this conclusion (Appendix H). These logged locations are all within 180 feet and encircle B208MW04 to the north, south, east and west. These wells indicate that the borings were all advanced deep enough to, but did not, encounter the sand interval observed in B208MW04.

The field notes recorded during December 1990 and January 1991 indicate the well was either pumped or bailed dry during six development episodes. On February 10, 1991, 12.66 gallons of water were purged from B208MW04. Six hours after the well was purged, the water level was still seven feet below the initial depth to water level measurement. Sixteen hours after the well was purged, the water level was still 1 foot below the initial depth to water level measurement. The slow increase of the water level appears to be indicative of the relative inability of the clay encompassing this interval to transmit water, and implies that the well is receiving little to no water from the surrounding clay. Additionally, the groundwater sampling notes for B208MW05 on July 22, 1991 indicate that the well was dewatered after removing approximately 20 gallons at a pumping rate of approximately 1 gpm during a pre-sample purging event. This phenomenon was also observed on July 23, 1991.

There may be water stored in the sand interval encountered in B208MW04 and B208MW05. However, over the long term, neither well can sustainably yield water at a

usable rate. Therefore, neither the sand interval (SW) observed in B208MW04 nor the sand (SC) interval in B208MW05 should qualify as a Class I groundwater resource.

4.9 LF5MW04D (GEA 4)

The boring log from LF5MW04D indicates soil was encountered from 22.0 to 32.0 ft-bgs in this boring that was described as silt (SM). Physical analysis of the soil sample taken from 26.0 to 28.0 ft-bgs within this interval indicates 87% fines. In addition, during drilling, the augers were left in the hole over night and water was measured at approximately 26 ft-bgs. SM soil may exhibit K values greater than 1.0×10^{-4} cm/sec; however, the high percentage of fines in this interval and the observed slow yield indicate that this is unlikely.

Field notes from the groundwater sampling episode on February 22, 1991 for LF5MW04D indicate that the static water level was at the top of casing in this well prior to development. After purging approximately 36 gallons of water from this well, on February 22, 1991, the water level dropped to below the top of the screen (i.e., 26 feet btoc). The well recovered to within 8.85 feet below the top of casing on February 27, 1991, five days later. On March 5, 1991, 25 gallons were removed from the well and the water level dropped from the top of casing to more than 22 feet btoc. Two and a half months later, the water level had recovered to approximately equilibrium. The slow rate of recovery in this well indicates that it will not provide a sustainable usable groundwater yield and should not qualify as a Class I groundwater resource.

4.10 LF7MOW02 (GEA 6)

LF7MW02 (GEA 6) The boring log for LF7MW02 indicates a clayey gravel (GC) from 31.5 to 34 ft-bgs and a saturated sandy gravel (GP) from 34 ft-bgs to an undetermined depth. Treating the GC interval as a gradational transition into the lower GP interval indicates that this interval is at least 8.5 feet thick. GC and GP soils may exhibit hydraulic conductivity values greater than 1.0×10^{-4} cm/sec (Freeze and Cherry, 1979). Based on these data, this interval might be classified as a Class I groundwater resource. However, the geology observed in LF7SB01 30 feet to the south indicates that this interval is not laterally extensive. Corroboration of this inference is provided by the development and sampling logs.

The field notes recorded during March 1991 indicate that from March 5, 1991 through March 26, 1991 the depth to water btoc increased from 11.86 feet to 15.74 feet. The field notes from March 26, 1991 indicate that the well went dry after being pumped for approximately 36 minutes at 0.7 gpm.

The water present in the well in March 1991 is likely left over from the well construction in February 1991 based on the water level and trend in water level observed in the well. Forty-five gallons of water were used during the construction of the well to prevent bridging of the filter pack around the screen and to hydrate the bentonite holeplug. The slow decline of the water level in March 1991 appears to be indicative of the relative inability of the clay encapsulating the gravel to receive water.

On April 4, 1991, 100 gallons of water were removed from LF7MW02, reducing the water level to more than 33 ft-btoc. The depth to water on April 6, 1991 was 33.59 ft-btoc and 33.58 ft-btoc on April 7, 1991. This depth roughly corresponds to the top of the gravel interval, implying that the interval is receiving little or no recharge from the overlying clay soils.

Between April 7, 1991 and July 8, 1991, the water level in LF7MW02 steadily rose from 33.58 ft-btoc to 23.90 ft-btoc. This slow recharge (i.e., 9.68 feet in three months) is indicative of the rate at which water can be removed from the well on a long term basis. That is, once the water stored in the lenticular gravel is removed, the yield from the gravel will be regulated by the ability of the clay surrounding the sand to transmit water. The clay becomes the rate limiting factor and the true indicator of the ability of the interval to yield water. This behavior is exactly what would be expected from a lenticular deposit of sand or gravel totally encapsulated by clay.

There may be water stored in the gravel; however, over the long term, the well cannot sustainably yield water at a usable rate. Therefore, the gravel interval (GC, GP) observed in LF7MW02 should not qualify as a Class I groundwater resource.

4.11 LF7MW04D, LF7MW05D, and LF7MW06D (GEA 6)

The soil borings for wells LF7MW05D and LF7MW06D encountered thin (less than 1 foot thick) intervals of sand (SP) and gravel (GP) that may exhibit K values greater than 1.0×10^{-4} cm/sec. Grain size distribution data are available for the 1 foot thick interval

(SC) encountered in LF7MW05D. Using the Kruger, Justin, and Hinds method, a K value of 3.0×10^{-3} cm/sec was estimated for this interval. LF7MW04D encountered a 2 foot thick clayey silt (MH) interval at approximately 23 feet below beach level. These intervals are not correlatable between borings, indicating that they are not laterally extensive. The wells are or have been artesian with flows at the surface of less than 0.25 gpm. The artesian nature of these wells is not surprising given their locations on the beach below Landfill 7.

While the flow at the surface is evidence that the deeper sediments are yielding water to the wells on the beach, the low flows produced by the relatively high upward vertical gradient are indicative of very low hydraulic conductivities for the screened interval as a whole. Although not quantified, the presence of a strong upward vertical gradient in this area is inferred from observations of water levels in the nested pairs of wells. That is, water levels in the shallow wells are several feet below the surface of the beach and water levels in the deeper wells are above the top of casing. This elevational difference is approximately seven feet. The difference in screened interval between LF7MW06S and D is approximately 22 feet yielding a vertical gradient of approximately 0.3 feet/foot. This relationship indicates that the predominant CL soils are controlling the flow not only to the well but in the more permeable SP and GP intervals. Although these intervals are yielding water at a very low rate, that rate may be adequate to provide 150 gpd as required by Criteria 4. That this rate is sustainable is evidenced by the continuing artesian conditions in the wells.

Although the intervals screened by the beach these wells are not typical of sediments generally associated with Class I groundwater resources, the extreme vertical hydraulic gradients in this area result in apparently sustainable flows from the wells. Because these flows may approach 150 gpd, this area is considered a potential Class I groundwater resource.

5.0 Conclusion

In Section 3.2, saturated soil intervals that met at least one of the criteria for a Class I groundwater resource were identified at fifteen well locations. Of the 91 wells/soil borings and 49 test pits, these fifteen wells represent the only locations on Fort Sheridan exhibiting the potential to be classified as a Class I groundwater resource. None of the other evaluated areas meet any of the criteria for Class I groundwater resources under Subpart B and so by default these areas should be classified as Class II groundwater resources.

The preponderance of available data suggests that the hydrogeologic setting at Fort Sheridan is best characterized as a Class II groundwater resource. The extent to which the fifteen intervals identified as potential Class I groundwater resources truly represent sustainable sources of groundwater has been evaluated in the context of the geologic setting of Fort Sheridan and of northern Illinois. The conclusion from this evaluation is that only two saturated intervals should still be considered potential Class I groundwater resources. These intervals are screened by the well at LF1MW03D and the artesian wells at the base of LF7.

The context of Fort Sheridan's geology also sets the framework for evaluating the extent to which the identified Class II areas are representative of the hydrogeology at the installation as a whole. As discussed in Section 4.0, the regional literature describes the geologic material at Fort Sheridan as a massive clay till that includes localized lenses of coarser material. These lenses of silt, sand, and/or gravel are discontinuous and are not hydraulically distinct from the clay matrix in which they are found.

The site specific data corroborate this description. Soil borings and test pits have been completed at widely distributed locations around Fort Sheridan at up to 74 ft-bgs without encountering an areally extensive source of Class I groundwater. The possible exceptions to this statement are the saturated sand encountered at approximately 50 ft-bgs in the soil boring for LF1MW03D and the artesian wells on the beach at Landfill 7 (GEA 6). Although it is unlikely that these intervals are areally extensive, they may meet at least two of the criteria for a Class I groundwater resource (i.e., Criteria 1 and 4).

IEPA Administrative Procedure #26 specifies that a minimum of one soil boring through the saturated interval to be classified is needed to demonstrate the absence of a Class I groundwater resource. However, given the size of Fort Sheridan, it seems reasonable that more than one is required. Only four Phase I RI soil borings have been completed to at least 70 ft-bgs at Fort Sheridan (i.e., LF7MW01, LF2SB03, LF6MW04D, and LF3MW04D) (Appendix B). Three other soil borings have been completed to greater than 70 ft-bgs for other studies (Appendices E and G). These borings are all in the vicinity of Landfill 7. Fourteen Phase I RI soil borings have been completed to at least 49 ft-bgs at various locations on Fort Sheridan (Figure 5-1). None of these soil borings encountered an interval above 49 ft-bgs that would qualify as a Class I groundwater resource (Appendix B). This includes LF1MW03D, which encountered the sandy interval that is a potential Class I groundwater resource at 51 ft-bgs and the artesian wells at the base of Landfill 7 (i.e., LF7MW04D, LF7MW05D, and LF7MW06D).

On this basis, it is concluded, with a reasonable level of certainty, that there are no Class I groundwater resources in the evaluated areas shallower than 49 ft-bgs. Therefore, these GEAs, without exception, can be classified as Class II groundwater resources shallower than 49 ft-bgs.

The extent to which this Class II designation can be extrapolated to the rest of the installation must be evaluated in light of the homogeneous nature of the ubiquitous massive clay till at Fort Sheridan. The regional and installation specific data on the hydrogeology at Fort Sheridan support this description of the nature of the till. The Phase I RI and other study areas from which the information was gathered are widely distributed across the installation. It probably cannot be said that they are truly randomly distributed since so much of the data come from Landfill study areas and these are biased toward ravine locations. It has not been determined if the locations of ravines have been affected by inhomogeneities in the subsurface geology. However, it can be said that the data were not collected with any intentional bias, and thus the picture of the hydrogeology they provide is reasonably representative of Fort Sheridan as a whole.

Given the size and representative nature of the database describing the hydrogeology at Fort Sheridan, the Class II groundwater resource designation above 49 ft-bgs can reasonably and defensibly be extrapolated to areas where there are no data or where the database is not as extensive to this depth. This can be done without risk that a Class I

groundwater might be affected provided the Class II classification is reassessed should contradictory information be discovered.

The designation of a Class II groundwater resource above 49 ft-bgs is protective of the two intervals identified as potential Class I groundwater resources. The vertical gradients at the two areas show that these intervals are not particularly vulnerable. Specifically, the conditions at LF1MW03D show a great deal of hydraulic separation between the shallow saturated interval in which LF1MW03S is screened, and the interval in which LF1MW03D is screened (water levels are at 16 ft-btoc vs. 40 ft-btoc, respectively. The boring log for LF1MW03D also indicates that there is an unsaturated interval between the two screened intervals. The conditions at LF7MW04D, LF7MW05D, and LF7MW06D show strong upward vertical gradients and some groundwater flow. Therefore, these screened intervals are technically upgradient of Landfill 7.

Given this understanding, the DA proposes that the shallow groundwater underlying Fort Sheridan above 49 ft-bgs be designated Class II. This designation should extend to the installation as a whole: however, if contradictory information becomes available either through ongoing RI activities or other sources, the designation of Class II in that area should be reevaluated.

6.0 Epilogue

The IEPA has reviewed the preceding groundwater classification document and generated comments pertaining to the conclusions reached in the document. The Army responded to these comments. Ultimately, several iterations of comments and responses were exchanged with the result that a consensus was reached among the members of the BCT regarding the classification of the groundwater beneath Fort Sheridan. The IEPA comments and Army responses are included in chronologic order as Appendix I .

In summary, IEPA's comments indicate that they generally concur with the Class II groundwater classification to 49 ft-bgs at Fort Sheridan. This concurrence was provided with the caveat that any potential Class I groundwater resource subsequently identified shallower than 49 ft-bgs would need to be fully evaluated, and might result in the reclassification of the groundwater in that area. However, despite their general concurrence, IEPA did provide initial comments stating their concerns with the classification of the groundwater in two areas. Specifically, in the area of the beach near Landfill 7, and more generally, in the area of former (filled) and existing ravines. For the specifics of these concerns, see the comments and responses in Appendix J.

The conclusion reached through the iterative comment and response process is that adequate information exists to extend the Class II designation of the groundwater proximal to Landfill 7 to 25 feet below the beach level at the eastern end of the landfill sloping upwards to 60 ft-bgs at the western end. This deeper Class II designation shall extend laterally a distance of 400 feet from the axis of the former Wells ravine (Landfill 7).

The groundwater proximal to existing and filled ravines will be designated as Class II to 10 feet below the bottom of the ravines at a minimum, except where the impetus exists and the data are available warrant a Class II designation below this depth or the criteria for a Class IV groundwater, as defined in 35 IAC 620.240, are applicable. The criteria for Class IV groundwater and the specifics of this discussion are included in Appendices A and J, respectively. .

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Appendix A

35 IAC 620 Subpart B Groundwater Classification and AP26 Guidance

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"Regulated recharge area" means a compact geographic area, as determined by the board pursuant to Section 17.4 of the Act, the geology of which renders a potable resource groundwater particularly susceptible to contamination.

"Resource groundwater" means groundwater that is presently being, or in the future is capable of being, put to beneficial use by reason of being of suitable quality.

"Setback zone" means a geographic area, designated pursuant to this act, containing a potable water supply well or a potential source or potential route having a continuous boundary, and within which certain prohibitions or regulations are applicable in order to protect groundwaters.

"Site" means any location, place, tract of land, and facilities, including but not limited to, buildings and improvements used for purposes subject to regulation or control by the act or regulations thereunder.

"Spring" means a natural surface discharge of an aquifer from rock or soil.

"Threshold dose" means the lowest dose of a chemical at which a specified measurable effect is observed and below which it is not observed.

"Treatment" means the technology, treatment techniques, or other procedures for compliance with 35 Ill. Adm. Code: Subtitle F.

"Unit" means any device, mechanism, equipment, or area (exclusive of land utilized only for agricultural production).

"USEPA" or "U.S. EPA" means the United States Environmental Protection Agency.

Section 620.115 Prohibition

No person shall cause, threaten or allow a violation of the Act, the IGPA or regulations adopted by the Board thereunder, including but not limited to this Part.

Section 620.125 Incorporations by Reference

a) The Board incorporates the following material by reference:

ASTM. American Society for Testing and Materials, 1976 Race Street, Philadelphia, Pa. 19103 (215) 299-5585

"Standard Practice for Description and Identification of Soils (Visual Manual Procedure)" D2488-84

GPO. Superintendent of Documents. U.S. Government Printing Office, Washington, D.C. 20401. (202) 783-3238:

Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper, Final Rule, 56 Fed. Reg. 26460-26564 (June 7, 1991).

National Primary Drinking Water Regulations, Final Rule, 56 Fed. Reg. 3526-3597 (January 30, 1991).

USEPA Guidelines for Carcinogenic Risk Assessment, 51 Fed. Reg. 33992-34003 (September 24, 1986).

NCRP. National Council on Radiation Protection, 7910 Woodmont Ave., Bethesda, MD (301) 657-6252

"Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure", NCRP Report Number 22, June 5, 1959.

NTIS. National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (703) 487-4600.

"Methods for Chemical Analysis of Water and Wastes," EPA Publication No. EPA-600/4-79-020. (March 1983). Doc. No. PB 84-128677

"Methods for the Determination of Organic Compounds in Drinking Water", EPA, EMSL, EPA-600/4-88/039 (Dec. 1988). Doc. No. PB 89-220461

"Practical Guide for Ground-Water Sampling", EPA Publication No. EPA/600/2-85/104 (September 1985). Doc. No. PB 86-137304

"Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", EPA Publication No. SW-846 (Third Edition, 1986, as amended by Revision I (December 1987). Doc. No. PB 89-148076

USGS. United States Geological Survey, 1961 Stout St., Denver, CO 80294 (303) 844-4169

"Techniques of Water Resources Investigations of the United States Geological Survey, Guidelines for Collection and Field Analysis of Ground-Water Samples for Selected Unstable Constituents", Book I, Chapter D2 (1981).

b) This Section incorporates no later editions or amendments.

Section 620.130 Exemption from General Use Standards and Public and Food Processing Water Supply Standards

Groundwater is not required to meet the general use standards and public and food processing water supply standards of 35 Ill. Adm. Code 302, Subparts B and C.

Section 620.135 Exclusion for Underground Waters in Certain Man-Made Conduits

This Part does not apply to underground waters contained in man-made subsurface drains, tunnels, reservoirs, storm sewers, tiles or sewers.

SUBPART B: GROUNDWATER CLASSIFICATION**Section 620.201 Groundwater Designations**

All groundwaters of the State are designated as:

a) One of the following four classes of groundwater in accordance with Sections 620.210 through 620.240:

1) Class I: Potable Resource Groundwater;

2) Class II: General Resource Groundwater;

3) Class III: Special Resource Groundwater;

4) Class IV: Other Groundwater, or
b) A groundwater management zone in accordance with Section 620.250.

Section 620.210 Class I: Potable Resource Groundwater

Except as provided in Sections 620.230, 620.240, or 620.250, Potable Resource Groundwater is:

a) Groundwater located 10 feet or more below the land surface and within:

1) The minimum setback zone of a well which serves as a potable water supply and to the bottom of such well;

2) Unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and that contains 12 percent or less of fines (i.e. fines which pass through a No. 200 sieve tested according to ASTM Standard Practice D2488-84, incorporated by reference at Section 620.125);

3) Sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or

4) Any geologic material which is capable of a:

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A) Sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less; or

B) Hydraulic conductivity of 1×10^{-4} cm/sec or greater using one of the following test methods or its equivalent:

- i) Permeameter;
- ii) Slug test; or
- iii) Pump test.

b) Any groundwater which is determined by the Board pursuant to petition procedures set forth in Section 620.260, to be capable of potable use. (Board Note: Any portion of the thickness associated with the geologic materials as described in subsections 620.210(a)(2), (a)(3) or (a)(4) should be designated as Class I: Potable Resource Groundwater if located 10 feet or more below the land surface.)

Section 620.220 Class II: General Resource Groundwater

Except as provided in Section 620.250, General Resource Groundwater is:

a) Groundwater which does not meet the provisions of Section 620.210 (Class I), Section 620.230 (Class III), or Section 620.240 (Class IV).

b) Groundwater which is found by the Board, pursuant to the petition procedures set forth in Section 620.260, to be capable of agricultural, industrial, recreational or other beneficial uses.

Section 620.230 Class III: Special Resource Groundwater

Except as provided in Section 620.250, Special Resource Groundwater is:

a) Groundwater that is determined by the Board, pursuant to the procedures set forth in Section 620.260, to be:

1) Demonstrably unique (e.g., irreplaceable sources of groundwater) and suitable for application of a water quality standard more stringent than the otherwise applicable water quality standard specified in Subpart D; or

2) Vital for a particularly sensitive ecological system.

b) Groundwater that contributes to a dedicated nature preserve that is listed by the Agency as set forth below:

1) A written request to list a dedicated nature preserve under this subsection must contain, at a minimum, the following information:

A) A general description of the site and the surrounding land use;

B) A topographic map or other map of suitable scale denoting the location of the dedicated nature preserve;

C) A general description of the existing groundwater quality at and surrounding the dedicated nature preserve;

D) A general geologic profile of the dedicated nature preserve based upon the most reasonably available information, including but not limited to geologic maps and subsurface groundwater flow directions; and

E) A description of the interrelationship between groundwater and the nature of the site.

2) Upon confirmation by the Agency of the technical adequacy of a written request, the Agency shall publish the proposed listing of the dedicated nature preserve in the Environmental Register for a 45-day public comment period. Within 60 days after the close of the public comment period, the Agency shall either publish a final listing of the dedicated nature preserve in the Environmental Register or provide a written response to the requestor specifying the reasons for not listing the dedicated nature preserve.

3) At least once annually, the Agency shall publish in the Environmental Register a complete listing of all dedicated nature preserves listed under this subsection.

4) For purposes of this Section the term "dedicated nature preserve" means a nature preserve that is dedicated pursuant to the Illinois Natural Areas Preservation Act (Ill. Rev. Stat. 1989, ch. 105, pars. 701 et seq.).

Section 620.240 Class IV: Other Groundwater

Except as provided in Section 620.250, Other Groundwater is:

a) Groundwater within a zone of attenuation as provided in 35 Ill. Adm. Code 811 and 814;

b) Groundwater within a point of compliance as provided in 35 Ill. Adm. Code 724, but not to exceed a distance of 200 feet from a potential primary or secondary source.

c) Groundwater that naturally contains more than 10,000 mg/L of total dissolved solids;

d) Groundwater which has been designated by the Board as an exempt

aquifer pursuant to 35 Ill. Adm. Code 730.104; or

e) Groundwater which underlies a potential primary or secondary source, in which contaminants may be present from a release, if the owner or operator of such source notifies the Agency in writing and the following conditions are met:

1) The outermost edge is the closest practicable distance from such source, but does not exceed:

A) A lateral distance of 25 feet from the edge of such potential source or the property boundary, whichever is less; and

B) A depth of 15 feet from the bottom of such potential source or the land surface, whichever is greater;

2) The source of any release of contaminants to groundwater has been controlled;

3) Migration of contaminants within the site resulting from a release to groundwater has been minimized;

4) Any on-site release of contaminants to groundwater has been managed to prevent migration off-site; and

5) No potable water well exists within the outermost edge as provided in subsection (e)(1).

f) Groundwater which underlies a coal mine refuse disposal area not contained within an area from which overburden has been removed, a coal combustion waste disposal area at a surface coal mine authorized under Section 21(s) of the Act, or an impoundment that contains sludge, slurry, or precipitated process material at coal preparation plant, in which contaminants may be present, if such area or impoundment was placed into operation after February 1, 1983, if the owner and operator notifies the Agency in writing, and if the following conditions are met:

1) The outermost edge is the closest practicable distance, but does not exceed:

A) A lateral distance of 25 feet from the edge of such area or impoundment, or the property boundary, whichever is less; and

B) A depth of 15 feet from the bottom of such area or impoundment, or the land surface, whichever is greater;

2) The source of any release of contaminants to groundwater has been controlled;

3) Migration of contaminants within the site resulting from a release to groundwater has been minimized;

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4) Any on-site release of contaminants to groundwater has been managed to prevent migration off-site; and

5) No potable water well exists within the outermost edge as provided in subsection (e)(1)

g) Groundwater within a previously mined area, unless monitoring demonstrates that the groundwater is capable of consistently meeting the standards of Sections 620.410 or 620.420. If such capability is determined, groundwater within the previously mined area shall not be Class IV.

Section 620.250 Groundwater Management Zone

a) Within any class of groundwater, a groundwater management zone may be established as a three dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site:

1) That is subject to a corrective action process approved by the Agency; or

2) For which the owner or operator undertakes an adequate corrective action in a timely and appropriate manner and provides a written confirmation to the Agency. Such confirmation must be provided in a form as prescribed by the Agency.

b) A groundwater management zone is established upon concurrence by the Agency that the conditions as specified in subsection (a) are met and groundwater management continues for a period of time consistent with the action described in that subsection.

c) A groundwater management zone expires upon the Agency's receipt of appropriate documentation which confirms the completion of the action taken pursuant to subsection (a) and which confirms the attainment of applicable standards as set forth in Subpart D. The Agency shall review the on-going adequacy of controls and continued management at the site if concentrations of chemical constituents, as specified in Section 620.430(a)(4)(B), remain in groundwater at the site following completion of such action. The review must take place no less often than every 5 years and the results must be presented to the Agency in a written report.

Section 620.260 Reclassification of Groundwater by Adjusted Standard

Any person may petition the Board to reclassify a groundwater in accordance with the procedures for adjusted standards specified in Section 28.1 of the Act and 35 Ill. Adm. Code 106. Subpart G. In any proceeding to reclassify specific groundwater by adjusted standard, in addition to the requirements of 35 Ill. Adm. Code 106. Subpart G, and Section 28.1(c) of the Act, the petition shall, at a minimum contain information to allow the Board to determine:

a) The specific groundwater for which reclassification is requested, including but not limited to geographical extent of any aquifers, depth of groundwater, and rate and direction of groundwater flow and that the specific groundwater exhibits the characteristics of the requested class as set forth in Sections 620.210(b), 620.220(b), 620.230, or 620.240(b).

b) Whether the proposed change or use restriction is necessary for economic or social development, by providing information including, but not limited to, the impacts of the standards on the regional economy, social benefits such as loss of jobs or closing of facilities, and economic analysis contrasting the health and environmental benefits with costs likely to be incurred in meeting the standards would be beneficial or necessary;

c) Existing and anticipated uses of the specific groundwater;

d) Existing and anticipated quality of the specific groundwater;

e) Existing and anticipated contamination, if any, of the specific groundwater;

f) Technical feasibility and economic reasonableness of eliminating or reducing contamination of the specific groundwater or of maintaining existing water quality;

g) The anticipated time period over which contaminants will continue to affect the specific groundwater;

h) Existing and anticipated impact on any potable water supplies due to contamination;

i) Availability and cost of alternate water sources or of treatment for those users adversely affected;

j) Negative or positive effect on property values; and

k) For special resource groundwater, negative or positive effect on:

1) The quality of surface waters; and

2) Wetlands, natural areas, and the life contained therein, including endangered or threatened species of plant, fish or wildlife listed pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seq., or the Illinois Endangered Species Protection Act (Ill. Rev. Stat. 1989, ch. 8, par. 331 et seq.).

SUBPART C: NONDEGRADATION PROVISIONS FOR APPROPRIATE GROUNDWATERS**Section 620.301 General Prohibition Against Use Impairment of Resource Groundwater**

a) No person shall cause, threaten or allow the release of any contaminant to a resource groundwater such that:

1) Treatment or additional treatment is necessary to continue an existing use or to assure a potential use of such groundwater; or

2) An existing or potential use of such groundwater is precluded.

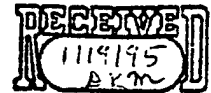
b) Nothing in this Section shall prevent the establishment of a groundwater management zone pursuant to Section 620.250 or a cumulative impact area within a permitted site.

c) Nothing in this Section shall limit underground injection pursuant to a permit issued by the Agency under the Act or issued by the Department of Mines and Minerals under "An Act in relation to oil, gas, coal and other surface and underground resources and to repeal an Act herein named" (Ill. Rev. Stat. 1989, ch. 96 1/2, pars. 5401 et seq., as amended).

d) Nothing in this Section shall limit the Board from promulgating nondegradation provisions applicable to particular types of facilities or activities which impact upon groundwater, including but not limited to landfills regulated pursuant to 35 Ill. Adm. Code. Subtitle G.

Section 620.302 Applicability of Preventive Notification and Preventive Response Activities

a) Preventive notification and preventive response as specified in Sections 620.305 through 620.310 applies to:



PROCEDURE FOR DETERMINATION OF A CLASS II GROUNDWATER

The Illinois Pollution Control Board adopted the Groundwater Quality Standards at 35 IAC Code 620, in November 1991. Included in this rulemaking are criteria for classifying groundwaters for purposes of determining the appropriate level of protection (i.e. applying the appropriate quality standards). Unless site-specific information demonstrates otherwise, the Bureau presumes that groundwater must meet Class I standards. The following is a procedure to demonstrate that groundwater beneath a facility does not meet the Class I criteria set forth in Section 620.210 and therefore, need only meet the Class II groundwater quality standards. The class of a groundwater is independent of its actual quality, except for certain Class IV groundwater.

Groundwater is classified in 35 IAC 620 as a Class II, general resource, groundwater when it:

- 1) Does not meet the provisions of Section 620.230 (Class III) or Section 620.240 (Class IV); (Determining whether the groundwater is Class III or Class IV is relatively straight forward, as is the requirement to determine if the groundwater has previously been classified as Class II groundwater by the Board.)
- 2) Has been found by the Board to be a Class II groundwater, pursuant to the petition procedures set forth in Section 620.260; (If a continuous zone containing groundwater begins within 10 feet of the ground surface and extends greater than ten feet below the ground surface it will not be considered a Class II groundwater if an additional criteria is met under 620.210, in this case it would be considered Class I groundwater. Although it may be possible, it is unrealistic to try and designate two distinct classes of groundwater within the same saturated hydrogeologic unit. But, if a facility can demonstrate that by cleaning the groundwater within ten feet of the surface to Class II specifications will not degrade the groundwater greater than 10 feet below the ground surface above Class I standards, the Agency may approve both Class I and II standards in accordance with the location of the groundwater.)
- 3) Is located less than ten feet below the ground surface; or,
- 4) Does not meet the provisions of Section 620.210,

which is further discussed in paragraphs (A) through (D) below.

Initially, the sources of information listed below should be considered to determine the appropriate classification of groundwater:

1. Published data concerning regional and local geologic and hydrogeologic conditions. (i.e. geologic surveys, former site investigations, etc.)
2. The locations of all potable water wells located within one mile of the site with the logs and/or dates of well completion attached.
3. Available on site boring logs which characterize the geology from ground surface to the first saturated unit or, if a perched zone is present, the first saturated unit below the perched zone.

If after collecting and reviewing the above information the groundwater is clearly not a Class II groundwater and one still wishes to pursue classification as Class II groundwater, further investigation including site specific information should be utilized to make a determination that the groundwater is subject to the Class II standards. If the site geology or hydrogeologic properties pass all criteria listed below, the groundwater is a Class II groundwater. The information requirements listed describe the minimum documentation which should be provided to IEPA.

- A. Groundwater cannot be located within the minimum setback of a well which serves as a potable water supply and to the bottom of such well;

The minimum setback zone of a well extends from the land surface to the bottom of the well as determined by the screen depth. This establishes a three-dimensional zone of protection around the well.

Section 14.1 of the Environmental Protection Act establishes minimum setbacks of less than 200 feet for a private water supply well or less than 400 feet for a public water supply well unless the specified minimum setbacks have been expanded under the Wellhead Protection Program and the Illinois Groundwater Protection Act.

This requirement may be satisfied by the submission of a scaled map delineating the site and all potable water wells located within a one mile radius from the unit/s of concern. The Illinois State Water Survey and/or the Division of Public Water Supplies of the Illinois

Environmental Protection Agency should be contacted, as well as other appropriate state and federal entities, to obtain this information. A copy of the state or federal agencies response to an information inquiry should be included with the information submitted by the facility. Also, a visual inspection of the area within 200 feet of the unit/s of concern should be conducted when possible to detect unlogged private wells.

- B. Formations beneath the facility cannot consist of unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and that contains 12 percent or less in fines (i.e. fines which pass through a No. 200 sieve tested according to ASTM Standard Practice D2488-84, incorporated by reference at Section 620.125);

This criterion is specific to the type formations listed. If a zone of saturation fails this Class I criterion, Class I may still apply pursuant to D below.

This criterion may be satisfied by the submission of, at a minimum, one site specific, continuously sampled boring log which clearly identifies the saturated interval from which a representative sample was obtained. Sieve test analysis should be conducted on several samples from each saturated interval which is at least five feet in thickness and composed of sand-sized grains or greater. In addition, the facility should submit the sieve data sheet, plot and a scaled map which identifies the location of each boring.

- C. Formations beneath the facility cannot consist of sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or

This requirement may be satisfied by the submission of, at a minimum, one site specific, continuously sampled boring log with a description of the geologic material present. This boring log should extend from the ground surface to a depth which is 10 feet into the uppermost water-bearing unit subject to Class I standards or bedrock, whichever is shallower. The boring(s) should be continuously sampled and located on a scaled site map. A representative sample, as used previously, is a sample obtained from each distinctive saturated unit within the boring. Also, a literature search of regional and local geologic conditions should be conducted with the results submitted to the Agency.

- D. Any geologic material which is not capable of a:

1. Sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less; or

This requirement may be satisfied by the submission of continuously sampled boring logs which demonstrate aquifer thickness. In addition, as-built well construction diagrams should also be submitted to the Agency for review. Furthermore, a pump test or equivalent must be conducted to determine the yield of the geologic material. Methodology, assumptions and any calculations performed should also be submitted to meet this requirement. If the aquifer geometry and transmissivity have been obtained through a site-specific field investigation, an analytical solution may be used to estimate well yield. The facility must demonstrate the appropriateness of an analytical solution to estimate well yield versus an actual field test. Well yield should be determined for either confined or unconfined.

2. Hydraulic conductivity of 1×10^{-4} cm/sec or greater using one of the following test methods or its equivalent:

This requirement may be satisfied by performing field and/or lab tests such as a permeameter, slug test and/or pump test.

An appropriate method of evaluation should be chosen based on the type of wells, the length of time over which data may need to be collected and, if known, the characteristics of the targeted aquifer. Such methods and the suggested information to be submitted to the Agency are outlined below and include:

- i. Permeameter;

If this method is chosen, samples of unconsolidated materials should be left in the field-sampling tubes which then becomes the permeameter sample chamber. Proceeding in this manner should allow as little disruption to the sample as possible. Unconsolidated samples should not be repacked into the sample chamber. An outline of the laboratory test method used and a description of the steps followed including any calculations should be submitted to the Agency for review.

ii. Slug tests; or

The information to be submitted to the Agency should include a description of the slug test method utilized and a discussion of the procedures followed during the tests, including any calculations performed.

A significant drawback to performing a slug test is that it is heavily dependent on a high-quality intake. If a well point is clogged or corroded, measured values may be inaccurate. Also, if a well is developed by surging or backwashing prior to testing, the measured values may reflect increased conductivities in the artificially induced gravel pack around the intake (Freeze and Cherry, 1979). If slug tests are chosen, a sufficient number of tests should be run to ensure that representative measures of hydraulic conductivities have been obtained and that lateral variations at various depths are documented (TEGD, 1986).

iii. Pump tests.

Preliminary or short-term drawdown tests should be performed initially to assess the appropriate pumping rate for the constant-rate tests. Several methods and/or equations may be used in evaluating data generated from pump tests such as Theis, Hantush-Jacob, Hvorslev and/or Theim equations. The method(s) of evaluation selected should be provided to the Agency with justification for their use, explanations of any assumptions made and examples of all calculations performed along with a description of the physical tests performed including the type of pump used.

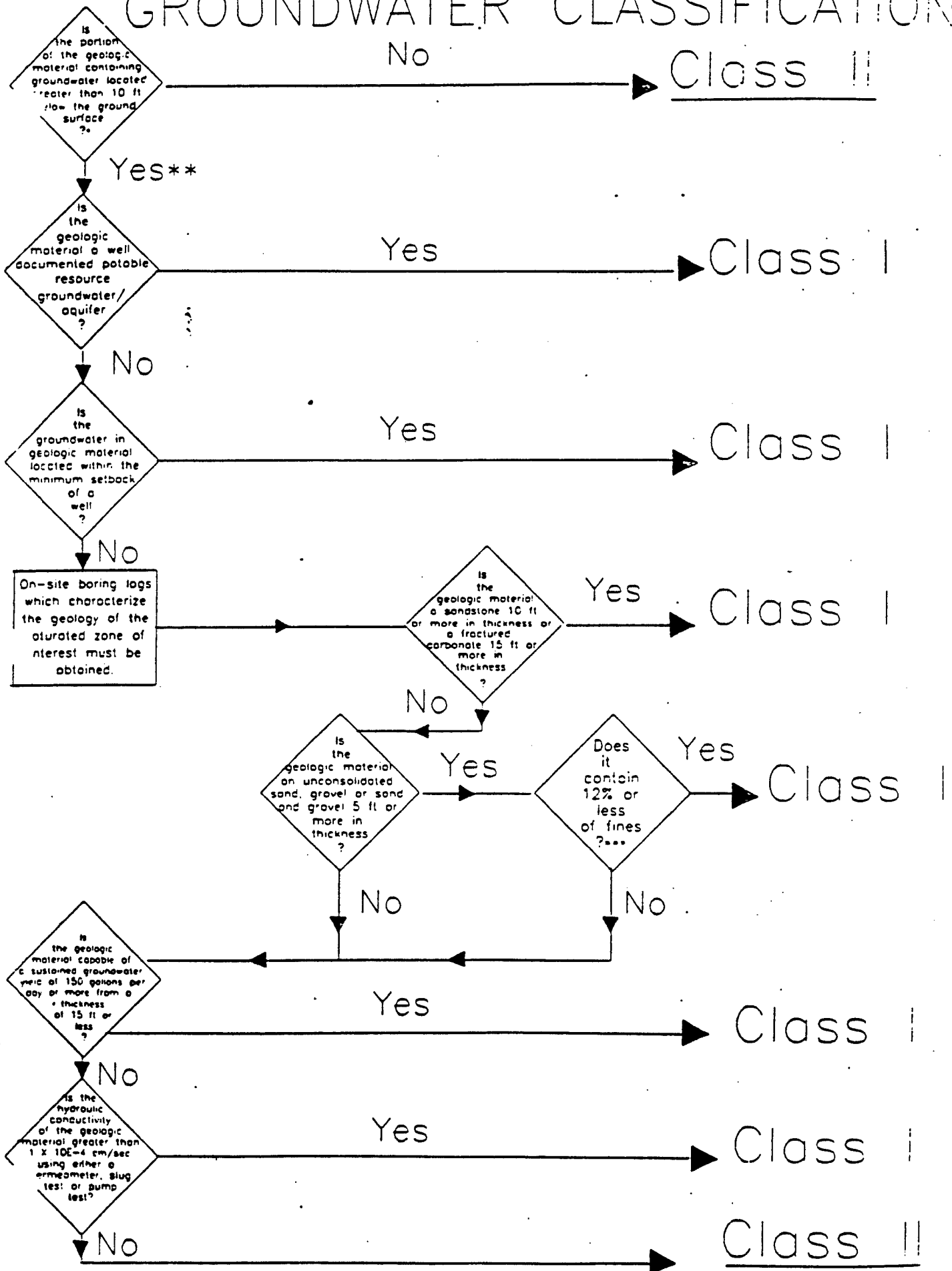
Two problems that should be considered are (1) storage of potentially contaminated water pumped from the well system and (2) potential effects of groundwater pumping on existing waste plumes (TEGD, 1986). Any groundwater pumped from wells in an area where there is a potential for contamination during either a yield test or hydraulic conductivity test should be containerized and tested to determine whether its contents would be a special waste. This will aid the facility in determining whether any special permits are needed for disposing of the

groundwater properly. Caution should be used when performing groundwater yield tests for extended periods of time, so that any contaminant plume present or suspected is not significantly altered.

NOTE: It may be beneficial to use laboratory evaluation methods to further support results of field tests; however, field methods provide the best definition of the hydraulic conductivity in most cases (TEGD, 1986). The most appropriate method to determine hydraulic conductivity for most sites will be the pump test provided proper evaluation of the data obtained from the test is utilized. Pump tests provide in-situ measurements that are averaged over a large aquifer volume and are preferred since they are able to characterize a greater portion of the subsurface compared to the other aquifer tests. Slug tests provide in-situ values representative of a small volume of porous media in the immediate vicinity of a piezometer tip, providing point values only, and may be more appropriate in very low-permeability materials in which conductivity is too small to conduct a pump test.

WRITTEN BY: KENN LISS
HEATHER YOUNG
FEBRUARY 19, 1993
REVISED MARCH 24, 1993

GROUNDWATER CLASSIFICATION



*See Board interpretation on the "10-foot" rule on page 12 of rulemaking R89-14(B).

**For each zone of saturated geologic material to a depth which is 10 ft into the uppermost water-bearing unit subject to Class I standards or bedrock whichever is shallower, the following criteria must be evaluated.

***Multiple representative samples obtained from the geologic material beneath the facility must fail to meet this criteria.

Appendix B

Phase I RI Soil Boring Monitoring Well and Test Pit Logs

GEA 1

Log of Well LF1SB1/MW1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Don Maki, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 01/14/91 Date Completed: 01/15/91

Total Depth Drilled: 40.5

Water Level While Drilling (bgl): 34

Ground Elevation: 690.991

Completion Information

Water Level At Completion (bgl):	Date: 01/15/91
Screened Interval: 30.33-40.35	Filter Pack Interval: 25.5-40.5
Screen Length: 10.02	Bentonite Seal Interval: 20.
End Cap Length: 0.15	Grout Interval: 0.0-20.3
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: 0.0 t
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.6
Total Casing: 33.70	Protective Casing Type: st
Top of Casing Elevation: 693.846	Protective Casing Length/.

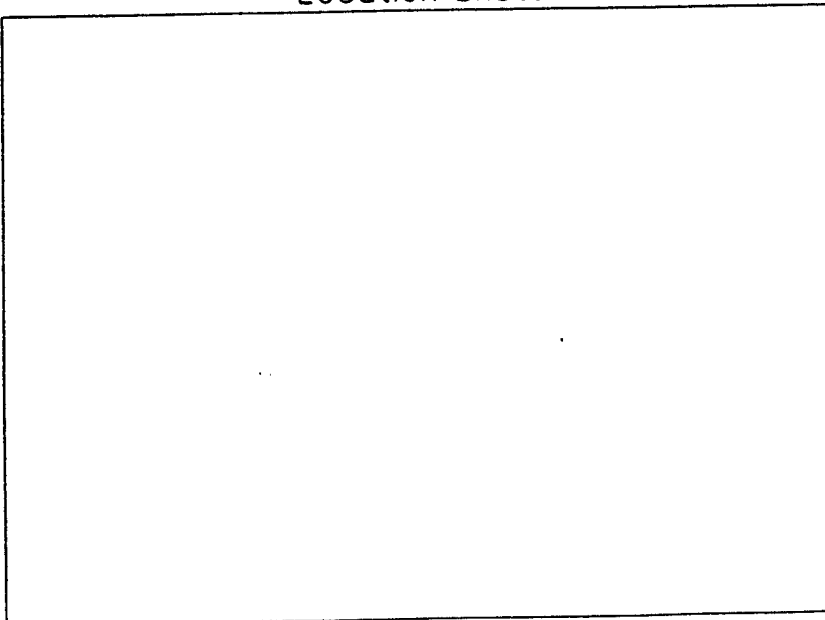
Drilling Shifts

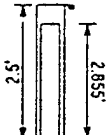





Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
01/14/91	0930	1600	0	42
01/15/91	0815	1447	42	42

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
PID	Photoionization Detector
NAB	Not Above Background

Location Sketch



Fort Sheridan RI/FS				Log of Well LF1SB1/MW1		
Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0						
	3.2	Silty Clay with Gravel 5% silt, <1% gravel, light yellowish brown (10YR6/4), medium plasticity, hard, dense, moist, no bedding, massive, gravel subrounded, <u>Glacial Till</u>	CL		 Cement	Sample on table at 1024 hours. Some organic material present in sample.
5	5.0	Silty Clay with Gravel 5% silt, <1% gravel, light yellowish brown (10YR6/4), medium to high plasticity, hard, dense, moist, no bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1049 hours. Gray reduction spots in clay. PID reading 0.8 ppm. Background reading 0.8 ppm.
10	5.0	Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1112 hours. Gravel up to 1 inch in diameter. PID reading of sample NAB.
15	5.0	Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, massive, gravel sub- rounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1135 hours. PID reading of sample NAB. Weather conditions: Clear and sunny with light southwest breeze, low to mid 30's.

Fort Sheridan RI/FS

Log of Well LF1SB1/MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15	5.0		CL		Cement	
20	5.0	Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, massive, gravel surrounded to subangular, <u>Glacial Till</u>	CL		Hole Plug	Sample on table at 1157 hours. PID reading of sample NAB.
25	5.0	Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL		Sand Pack	Sample on table at 1219 hours. PID reading of sample NAB.
30	5.0	Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, massive, gravel sub- rounded to suangular, <u>Glacial Till</u>	CL			Sample on table at 1243 hours. PID reading of sample NAB.

Fort Sheridan RI/FS

Log of Well LF1SB1/MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30						
	5.0		CL			
		Gravelly Sand: 70% fine sand, 20% coarse sand, 10% gravel, gray (10YR5/1), nonplastic, very soft, very loose, very moist, no bedding, grains angular to subrounded, <u>Glacial Outwash</u>	SP			
35		Gravelly Sand: 70% fine sand, 20% coarse sand, 10% gravel, gray (10YR5/1), nonplastic, very soft, very loose, wet, no bedding, grains angular to subrounded, <u>Glacial Outwash</u>	SP			Sample on table at 1408 hours. PID reading of sample NAB. Saturation at 34 feet. Gravel up to 2.5 inches in diameter in sand. = 200 10
	3.5		SP			
40		Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1430 hours. PID reading of sample NAB.
	3.0		CL			
45						

Sand Pack

Log of Well LF1SB2/MW2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Don Maki, ESE, Inc.	
Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Drilling Rig: Brat	Drilling Method: 6 1/4" HSA
Soil Sampling Device: Laskey Sampler	
Date Started: 01/21/91	Date Completed: 01/22/91
Total Depth Drilled: 34	
Water Level While Drilling (bgl): 26.5	Ground Elevation: 685.630

Completion Information

Water Level At Completion (bgl):	Date:
Screened Interval: 24.0-34.0	Filter Pack Interval: 18.5-34.0
Screen Length: 9.99	Bentonite Seal Interval: 12.8-18.5
End Cap Length: 0.15	Grout Interval: 0.0-12.8
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: 0.0 to -0.5
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.6
Total Casing: 26.13	Protective Casing Type: stick-up 6"
Top of Casing Elevation: 687.957	Protective Casing Length/AG: 5/2.5

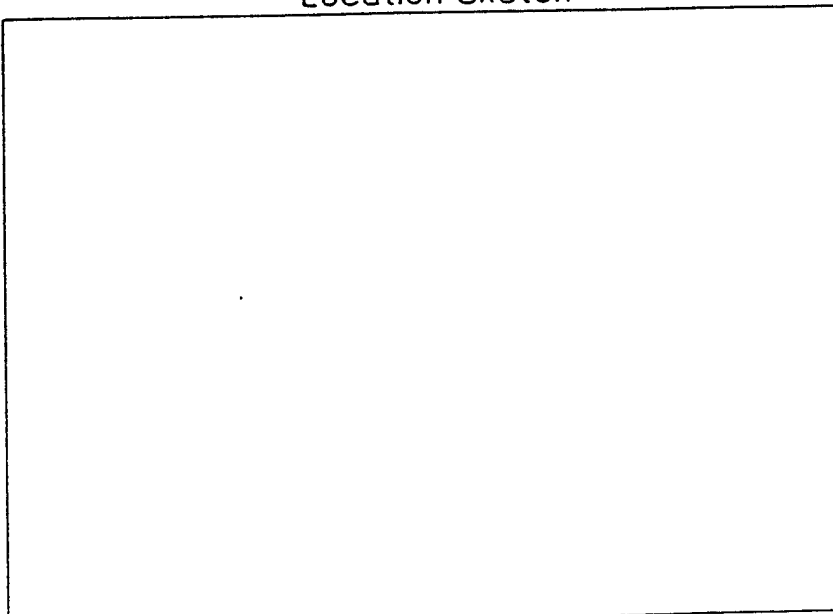
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
01/21/91	1240	1645	0	34
01/22/91	0900	1555	34	34

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
PIO	Photoionization Detector
NAB	Not Above Background

Location Sketch



Fort Sheridan RI/FS

Log of Well LF1SB2/MW2

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Silty Clay with Gravel 5% silt, <1% gravel, brown (10YR5/3), medium plasticity, hard, dense, dry to moist, no internal bedding, gravel subrounded to subangular, <u>Glacial Till</u>			2.3'	Sample on table at 1349 hours. PID reading for breathing zone 0.0 ppm.
2.0			CL			
5.0		Silty Clay with Gravel 5% silt, <1% gravel, brown (10YR5/3), low to medium plasticity, hard, dense, dry to moist, no internal bedding, gravel subrounded to subangular, <u>Glacial Till</u>				Sample on table at 1408 hours. PID reading of sample 0.0 ppm.
			CL			
10.0		Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), low to medium plasticity, hard, dense, dry to moist, no internal bedding, gravel subrounded to subangular, <u>Glacial Till</u>				Sample on table at 1427 hours. Color changes from brown (10YR5/3) to gray (10YR5/1). PID reading of sample 0.0 ppm.
			CL			
15.0		Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no internal bedding, gravel subrounded to subangular, <u>Glacial Till</u>				Sample on table at 1459 hours. PID reading of sample 0.0 ppm. Weather conditions: 95% overcast with 5-10 mph northwest wind, no precipitation, -18 degrees F. windchill temperature.
			CL			
					Hole Plug	


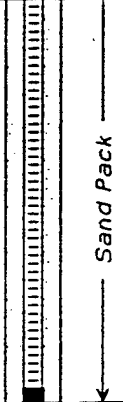
Fort Sheridan RI/FS

Log of Well LF1SB2/MW2

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
	5.0		CL			
20						
	5.0	Silty Clay with Gravel: 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no internal bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1528 hours. PID reading of sample 0.0 p
25						
		Silty Clay with Gravel: 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no internal bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1553 hours. PID reading of sample 0.0 ppm. Samples freeze to table in minutes.
	4.0	Gravelly Sand with Clay and Silt: 10% gravel, 85% sand (65% fine, 20% coarse), 3% clay, 2% silt, gray (10YR5/1), nonplastic, very soft, very loose, wet, no internal bedding, grains subrounded to subangular, <u>Glacial Outwash</u>	SP			
	4.25	Gravelly Sand with Clay and Silt: 10% gravel, 85% sand (65% fine, 20% coarse), 3% clay, 2% silt, gray (10YR5/1), nonplastic, very soft, very loose, wet, no internal bedding, grains subrounded to subangular, <u>Glacial Outwash</u>	SP			Sample on table at 1629 hours. PID reading of sample 0.0 ppm.
30			CL			

Fort Sheridan RI/FS

Log of Well LF1SB2/MW2

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS	Lithologic	Well Construction	Comments
			Classification	Log		
30	4.25	Silty Clay with Gravel: 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no internal bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL			
35						
40						
45						

Log of Well LF1SB3D/MW3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: Jeff McCormack, James W. Ashley, ESE, Inc.	
Drilling Rig: CME-55 and Brat I	Drilling Method: 4 1/4", 8 1/4", 6 1/4" HS
Soil Sampling Device: Laskey Sampler	
Date Started: 12/22/90	Date Completed: 01/09/91
Total Depth Drilled: 56	
Water Level While Drilling (bgl): 45	Ground Elevation: 683.128

Completion Information

Water Level At Completion (bgl): 49.5	Date: 01/09/91
Screened Interval: 45.5-55.5	Filter Pack Interval: 40.0-56.0
Screen Length: 10.025	Bentonite Seal Interval: 33.0-40.0
End Cap Length: 0.35	Grout Interval: 0.0-33.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: 0.0-0.5
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.6
Total Casing: 47.51	Protective Casing Type: stick-up 6"
Top of Casing Elevation: 685.637	Protective Casing Length/AG: 5/2.5

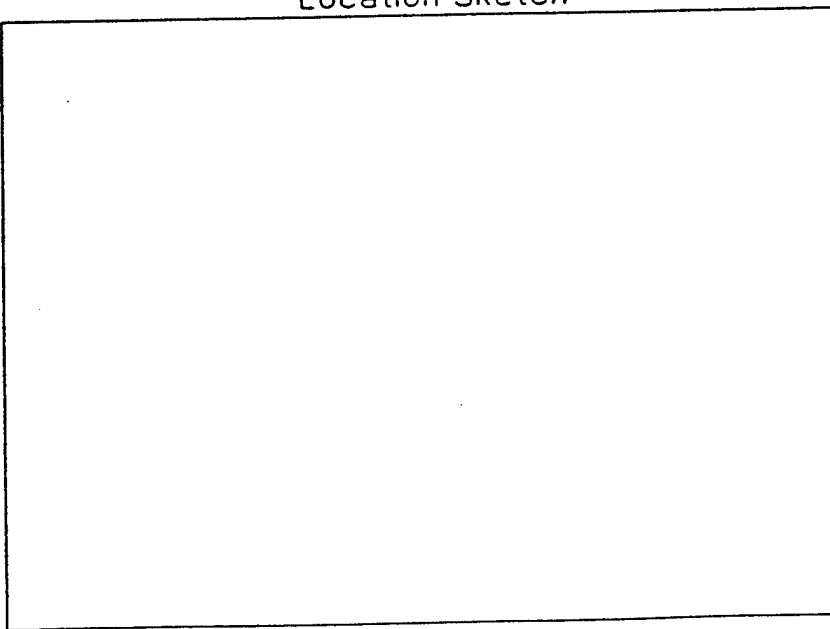
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
01/08/91	0915	1841	0	51
01/09/91	0730	2007	51	56
01/10/91	0830	1200	56	56

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
PID	Photoionization Detector
NAB	Not Above Background
UXB	UXO subcontractor
NL	Not Logged
FM	Fill Material
TD	Total Depth
hrs.	hours
ft.	feet

Location Sketch



Fort Sheridan RI/FS

Log of Well LF1SB3D/MW3

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Fill Material: cinders mixed with clay, glass, ceramic pieces, black (10YR 2/1), 30% clay, 60% cinders, 10% other debris, slightly moist.	FM			<p>Note: Jeff McCormack logged the first 24 feet from cuttings with the CME-55 using 4 1/4" and 8 1/4" HSA. The drilling shifts are as follows:</p> <p>12/02/90 1030-1130 hrs. 0 to 24 ft. 12/04/90 1545-2400 hrs. 24 to 26 ft. 12/05/90 0000-0040 hrs. 24 to 26 ft. 24 to 26' was not logged. Jim Ashley logged from 26' to TD with the Laskey Sampler using the BRAT I and 6 1/4" HSA. UXB cleared location at surface down to 5' UXB cleared location from 4 - 9' after drilling from 0 - 4'. Drilled 4 - 9', UXB cleared 9 - 14'. Drilled 9 - 14', UXB cleared borehole from 14 - 19'. Picking up small amounts of metal on magnetometer. Drilled 19 - 24', drilling tightening up at 23' where native clay was found at LF1SB03S. No returns from the clay drilled at 23 - 24'; since no split spoon sample was collected or returns seen, it is inferred by depth and the tight drilling from 23 - 24' that we are one foot into the clay material.</p>
5						
10						
		Fill Material: clay and cinders, fly ash, black (10YR 2/1), 35% clay, 55% cinders and fly ash, 10% miscellaneous debris including glass and brick, moist to wet.	FM			
		Fill Material: cinders, fly ash and slag, 70% slag, 25% cinders and fly ash, 5% clay, wet.	FM			
15						

Fort Sheridan RI/FS

Log of Well LF1SB3D/MW3

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
			FM			
20						
		Clay: some sand and gravel.	CH			
		not logged, assumed clay	NL			Not Logged
25						
		Clay with Gravel: 99% clay, <1% gravel, dark gray, (10YR4/1), high plasticity, hard, dense, moist, no apparent bedding, <u>Glacial Till</u>	CH			Sample on table at 1440 hours. PID reading of sample 0.0 ppm.
	4.5					
30						

Fort Sheridan RI/FS

Log of Well LF1SB3D/MW3

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30	4.5	Clay with Gravel and Sand: 99% clay, <1% gravel and sand, (10YR5/1), medium plasticity, hard, dense, moist to 33.5 then dry, no apparent bedding. <u>Glacial Till</u>	CH			
35	5.0	Clay with Gravel 99% clay, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding. <u>Glacial Till</u>	CL		Cement	Sample on table at 1530 hours. PID reading of sample 0.0 ppm. Clay at 33.5 feet is very dry and powders easily between thumb and forefinger to a floury consistency. The sand is a very thin lens of quartz-rich, subrounded sand, USCS SC, encountered at 36 feet.
40	5.0	Clay with Gravel 99% clay, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding. <u>Glacial Till</u>	CH		Hole Plug	Sample on table at 1615 hours. PID reading of breathing zone 0.0 ppm. PID reading of sample 0.0 ppm. Clay ball loosely coated with coarse sedimentary debris has been incorporated into till. Possibly stream-transported armored mudball. Ball was saturated.
45	5.0	Clay with Gravel 99% clay, <1% gravel (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding. <u>Glacial Till</u>	CH		Sand Pack	Sample on table at 1700 hours. PID reading of sample 0.0 ppm. Sand and gravel layer 6.5 inches thick with very sharp bedding contacts. Coarse sand grains, up to 3mm in diameter. Weather conditions: Stratocumulus overcast, southwest breeze at 5 mph, low 30's, no precipitation.

Fort Sheridan RI/FS

Log of Well LF1SB3D/MW3

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
45	5.0	Sand with Gravel: 50% fine sand, 25% coarse sand, 20% gravel, 5% silt, gray (10YR5/1), nonplastic, very soft, loose, very moist to wet, no apparent bedding, <u>Glacial Outwash</u>	CH			Sample on table at 1750 hours. PID reading of sample 0.0 ppm. Sand lenses are as characterized for 45.5 to 46 foot depth interval.
		Clay with Gravel: 99% clay, <1% gravel, gray (10YR5/1), medium to high plasticity, hard where moist, soft where saturated (49% S), dense, moist to wet, no apparent bedding, <u>Glacial Till</u>	SP			
			CH			
			SP			
	4.25		CH			
			SP			
50			CH			Sample on table at 1105 hours (01/09/91). PID reading of sample 0.0 ppm.
		Gravelly Sand with Silt: 50% fine sand, 30% coarse sand, 15% gravel, 5% silt, gray (10YR5/1), nonplastic, very soft, loose, moist, no apparent bedding, grains subrounded to subangular, <u>Glacial Out-wash</u>	SP			
	1.0					
55						
60						

Log of Well LF1SBO3S/MWO3S

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: Jeff McCormack, ESE, Inc.	
Drilling Rig: CME-55	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2" Split Spoon	
Date Started: 12/01/90	Date Completed: 12/02/90
Total Depth Drilled: 24	
Water Level While Drilling (bgl): 15	Ground Elevation: 682.213

Completion Information

Water Level At Completion (bgl): 15	Date: 12/02/90
Screened Interval: 13.10-22.90	Filter Pack Interval: 8.4-24.0
Screen Length: 10.11	Bentonite Seal Interval: 4.0-8.4
End Cap Length: 0.5	Grout Interval: 0-4.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5 to 0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 15.46	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 684.648	Protective Casing Length/AG: 5/2.70

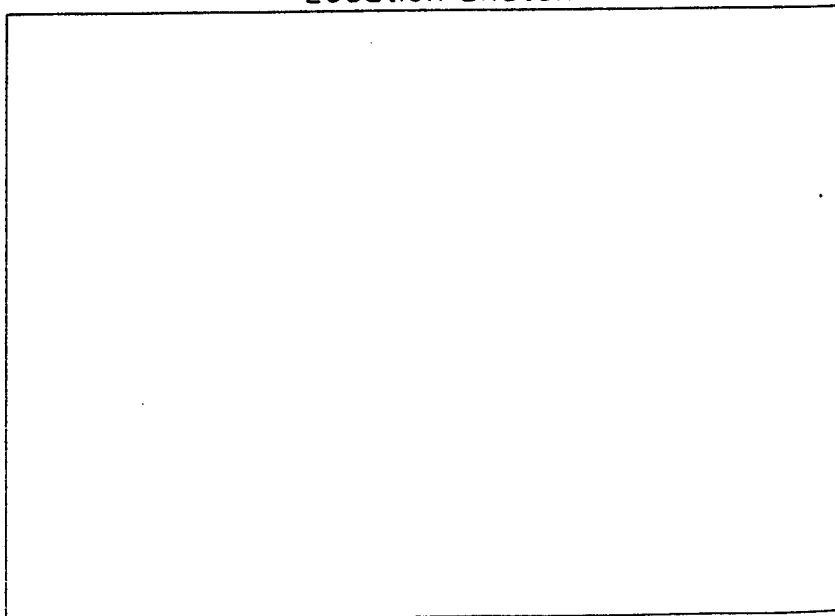
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
12/01/90	1150	2030	0	24
12/02/90	1315	1900	24	24

Abbreviations


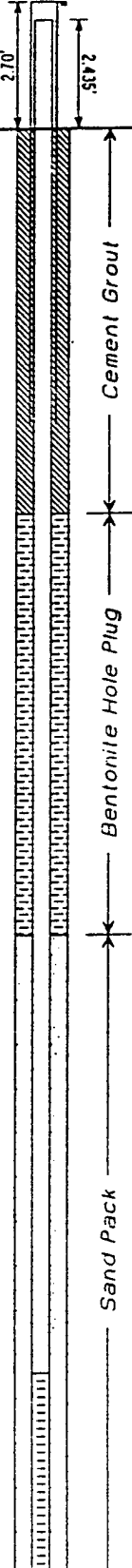

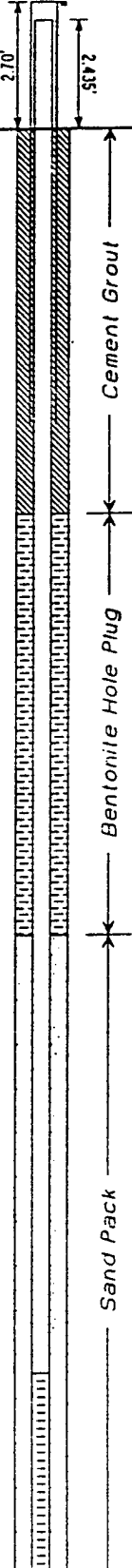
Abbr.	Meaning
med	medium
ID	Inner Diameter
HSA	Hollow Stem Auger
BGL	Below Ground Level
trace	< 5%
few	5-10%
little	15-25%
some	30-40%
mostly	50-100%

Location Sketch



Fort Sheridan RI/FS

Log of Well LF1SBO3S/MW03S

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Fill Material: 0 - 4'. Sandy clay, 15% med sand to fine gravel, very dark brown (10YR 2/2), high plasticity, very soft, moist.	FI M			encountered what sounded like gravel, probably brick.
5			Fill Material: pieces of glass and brick, very dark gray to black (5YR 2.5/1 - 5/3), low plasticity, med dense, slightly moist.				
11	1.8		Fill Material (not logged)				
18			Fill Material: sand with clay and gravel, 5% silt, 20% fine-med gravel, very dark grayish brown and yellow (10YR 3/2 and 7/3), non plastic, loose, slightly moist, very angular.				chunks of cinders and ash, brick pieces, no more glass.
8	2.0		Fill Material (not logged)				
10			Fill Material: sand size fill with gravel, very dark gray to brownish yellow (10YR 3/1 - 6/6), non plastic, loose, wet, angular.	FI M			
15	1.7						bottom of hole is wet although formation did not collapse when augers were pulled. drilling 14-19" went very quick, minimal returns, drilled like very soft saturated material.

Fort Sheridan RI/FS

Log of Well LF1SB03S/MW03S

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS	Lithologic Log	Well Construction	Comments
				Classification			
15	1	1.7	Fill Material (not logged)	FM			1517 cleaned out borehole by rotating augers to 19' approximately 20 - 21' to 23' drilled like clay, drilling tightened up.
1							
7							
20	5	1.1	Fill Material: cinders, ash, clay, dark gray (10YR 4/1), non plastic, very loose, wet, angular, back-filled ravine.	FM			
6							
3							
6	6		Clay: some sand and gravel (10% fine sand to fine gravel), grey (10YR 5/1), high plasticity, very stiff, moist, <u>fill</u> .	CH			
8							
14							
18	2.0						
25	25						
30							

Log of Well LF1SB4/MW4

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Don Maki, ESE, Inc.	
Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Drilling Rig: Brat	Drilling Method: 6 1/4" HSA
Soil Sampling Device: Laskey Sampler	
Date Started: 01/11/91	Date Completed: 01/12/91
Total Depth Drilled: 34	
Water Level While Drilling (bgl): 18.5	Ground Elevation: 683.069

Completion Information

Water Level At Completion (bgl): 21.0	Date: 01/12/91
Screened Interval: 6.5-26.5	Filter Pack Interval: 11.5-27.0
Screen Length: 10.03	Bentonite Seal Interval: 6.5-11.5
End Cap Length: 0.31	Grout Interval: 0.0-6.5
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: 0.0 to -0.5
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.6
Total Casing: 16.16	Protective Casing Type: stick-up 6"
Top of Casing Elevation: 685.776	Protective Casing Length/AG: 5/2.5

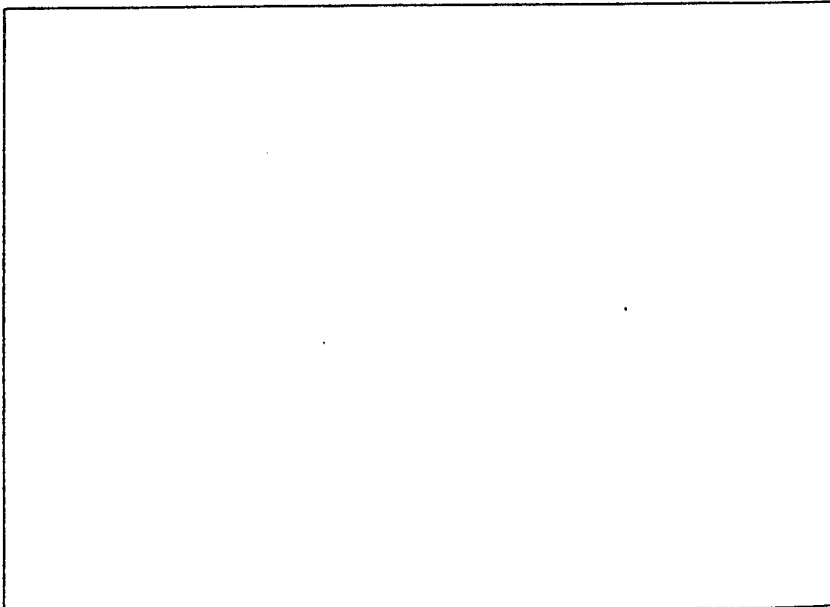
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
01/11/91	0840	1733	0	26.5
01/12/91	0745	1027	26.5	26.5

Abbreviations

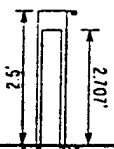

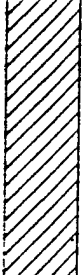

Abbr.	Meaning
HSA	Hollow Stem Augers
PID	Photoionization Detector
NAB	Not Above Background

Location Sketch



Fort Sheridan RI/FS

Log of Well LF1SB4/MW4

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	Well Construction		Comments
			USCS Classification	Lithologic Log	
0	4.0	Silty Clay: 5% silt, very dark grayish brown (10YR3/2) in top - soil, yellowish brown (10YR5/4) in deeper zones, low plasticity, hard, medium density, moist, no apparent bedding, <u>Glacial Till</u>	CL		Sample on table at 1045 hours. PID background reading 10 ppm. PID reading of sample NAB. Particles of dark brown and black organic material; streak where tube contacts sample. Weather conditions: Rain and freezing rain, southwest wind 1-5 mph, thunder heard.
5	5.0	Silty Clay with Gravel: 5% silt, <1% gravel, yellowish brown (10YR5/4), medium plasticity, hard, dense, dry to moist, no apparent bedding, gravel subrounded, <u>Glacial Till</u>	CL		Sample on table at 1107 hours. PID reading of sample NAB. Gravel around 0.25 inches in diameter.
10	5.0	Silty Clay with Gravel: 5% silt, <1% gravel, dark gray (10YR4/1), medium to high plasticity, hard, dense, moist, no apparent bedding, gravel subrounded, <u>Glacial Till</u>	CL		Sample on table at 1134 hours. PID background reading now 3.4 ppm. PID reading of sample NAB. Gravel size increases to 1.25 inches in diameter. Relative volume does not change. Weather conditions change to very wet snow.
15	4.25	Silty Clay with Gravel: 5% silt, <1% gravel, dark gray (10YR4/1), medium to high plasticity, hard, dense, moist, no apparent bedding, gravel subrounded, <u>Glacial Till</u>	CL		Sample on table at 1230 hours. PID background reading now 2.5 ppm. PID reading of sample NAB.

Fort Sheridan RI/FS

Log of Well LF1SB4/MW4

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
	4.25		CL			
		Gravelly Sand with Silt and Clay: 70% sand, 15% gravel, 10% clay, 5% silt, dark gray (10YR4/1), nonplastic, very soft, very loose, wet, no apparent bedding, rounded to subangular, <u>Glacial Outwash</u> .	SP			Sample on table at 1300 hours. Water pours from sample tube. PID reading of sample NAB.
20	5.0	Silty Clay with Gravel: 5% silt, <1% gravel, dark gray (10YR4/1), medium to high plasticity, hard, dense, moist, no bedding, gravel sub- rounded to subangular, <u>Glacial Till</u> .	CL			
		Gravelly Sand with Silt and Clay: 70% sand, 15% gravel, 10% clay, 5% silt, dark gray (10YR4/1), nonplastic, very soft, very loose, wet, no apparent bedding, rounded to subangular, <u>Glacial Outwash</u> .	SP			
25	2.5	Gravelly Sand with Silt and Clay: 65% sand, 20% gravel, 10% clay, 5% silt, gray (10YR5/1), nonplastic, very soft, very loose, wet, no apparent bedding, rounded to subangular, <u>Glacial Outwash</u> .	SP			Sample on table at 1331 hours. PID reading of sample NAB.
30						

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Log of Well LF1SB4/MW4

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30						
35						
40						
45						

Log of Well LF1SB5

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Don Maki, ESE, Inc.	
Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Drilling Rig: Brat	Drilling Method: 6 1/4" HSA
Soil Sampling Device: Laskey Sampler	
Date Started: 01/12/91	Date Completed: 01/13/91
Total Depth Drilled: 36	
Water Level While Drilling (bgl):	Ground Elevation: 689.569

Completion Information

Water Level At Completion (bgl):	Date:
Screened Interval:	Filter Pack Interval:
Screen Length:	Bentonite Seal Interval:
End Cap Length:	Grout Interval: 0-34
Screen Type/Dia.:	Mortar Collar Interval:
Casing Type/Dia.:	Drainage Port Height:
Total Casing:	Protective Casing Type:
Top of Casing Elevation:	Protective Casing Length/AG: /

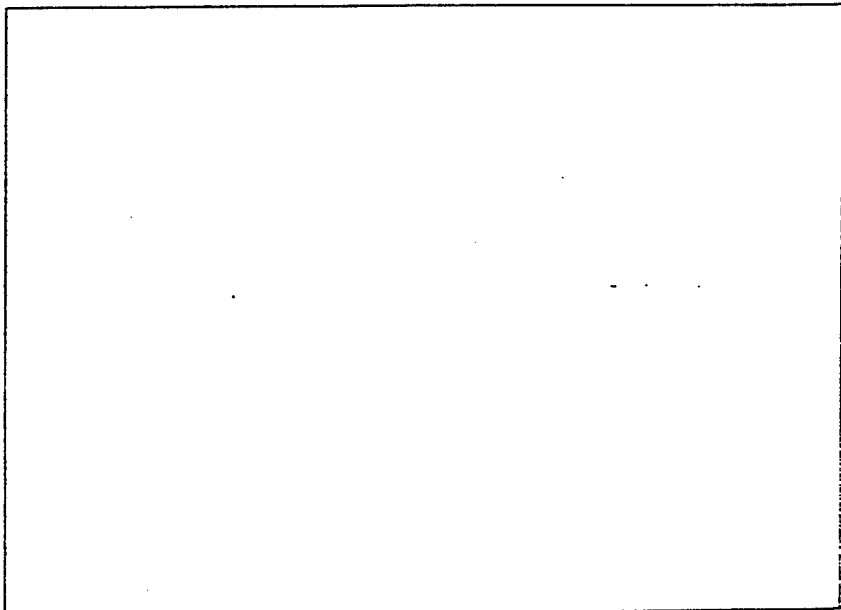
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
01/12/91	1326	1750	0	34
01/13/91	0815	1115	34	34

Abbreviations






Abbr.	Meaning
HSA	Hollow Stem Augers
PID	Photoionization Detector
NAB	Not Above Background

Location Sketch



Fort Sheridan RI/FS

Log of Well LF1SB5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0	4.0	Silty Clay with Gravel 5% silt, <1% gravel, yellowish brown (10YR6/4), low plasticity, hard, dense, dry to slightly moist, no apparent bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL		Cement	Sample on table at 1336 hours. No well installed. Saturation was not encountered.
4	5.0	Silty Clay with Gravel 5% silt, <1% gravel, brown (10YR5/3) medium plasticity, hard, dense, moist, no apparent bedding, gravel subrounded to subangular, <u>Glacial Till</u>	GW			Sample on table at 1418 hours. Near vertical, sharp contact between gravelly sand and till implies that sand is fill material for trench.
9		Sand and Gravel: 60% sand, 40% gravel, yellowish brown (10YR6/6), very soft, very loose, moist, no apparent bedding, rounded to sub-rounded grains, <u>Fill Material</u>	CL			
10	5.0	Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1536 hours. PID reading of sample is 0.0 ppm.
15	5.0	Silty Clay with Gravel 5% silt, <<1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no apparent bedding, gravel subrounded to rounded, <u>Glacial Till</u>	CL			Sample on table at 1609 hours. PID breathing zone reading is 0.0 ppm. PID reading of sample is 0.0 ppm. Significantly less gravel in till than in previous sample.


Fort Sheridan RI/FS

Log of Well LF1SB5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
5.0			CL			
20		Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no apparent bedding, gravel subrounded to rounded, <u>Glacial Till</u>	CL			Sample on table at 1637 hours. PID reading of sample is 0.0 ppm.
5.0			CL			
25		Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no apparent bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1659 hours. PID reading of sample is 0.0 ppm.
5.0			CL			
30		Silty Clay with Gravel 5% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no apparent bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1730 hours. PID reading of sample is 0.0 ppm.
5.0						

Fort Sheridan RI/FS

Log of Well LF1SB5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS	Lithologic Log	Well Construction	Comments
			Classification			
30	5.0		CL		Cement	
35						
40						
45						

Log of Well B126 MW01

Fort Sheridan RI/FS
Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: James S. Guentert, ESE, Inc.	
Drilling Rig: CME-55	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2" Split Spoon	
Date Started: 12/13/90	Date Completed: 12/24/90
Total Depth Drilled: 23.85	
Water Level While Drilling (bgl):	Ground Elevation: 672.200

Completion Information

Water Level At Completion (bgl): 23.0	Date: 12/24/90
Screened Interval: 13.5-23.5	Filter Pack Interval: 8.5-23.85
Screen Length: 10	Bentonite Seal Interval: 3.5-8.5
End Cap Length: 0.15	Grout Interval: 0-3.5
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 15	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 674.523	Protective Casing Length/AG: 5/2.5

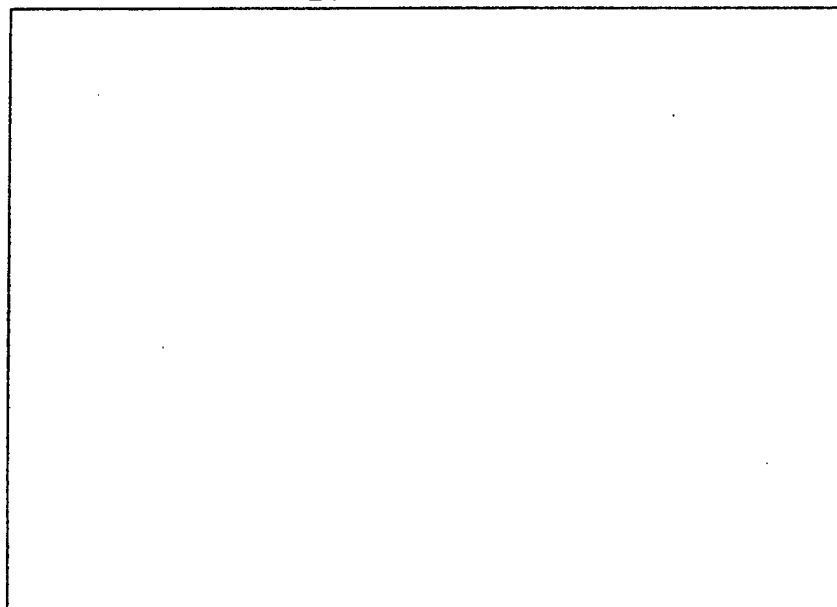
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
12/13/90	1332	1805	0	24
12/24/90	0845	1100		

Abbreviations

Abbr.	Meaning
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch



Fort Sheridan RI/FS

Log of Well B126 MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0							
2			Clayey Silt: 10% fine sand, 40% clay, v. dark brown (10YR 2/2), low plasticity, soft, moist, <u>Top Soil</u>	ML GC			11/13/90 Collected 3"x2" SS @ 0'-2' Drilled down to 2 feet
5		1.7	Clayey Gravel: 40% clay, gravel is angular-subangular, dark yellowish brown (10YR 3/4), low-medium plasticity, medium stiff, moist-dry, <u>Fill Material</u>	CL			
6			Silty Clay: 20-25% silt, 5% fine sand, yellowish brown (10YR 5/8), low plasticity, medium stiff, dry, 0 ppm = PID.	CL			Collected 3"x2" SS @ 2'-4' Drilled down to 4 feet
8		1.9	Silty Clay: 20-25% silt, 10% fine-medium sand, <5% fine gravel, yellowish brown (10YR 5/8) and gray (10YR 5/1), low plasticity, medium stiff-stiff, dry some oxidation along fractures, 0 ppm = PID.	CL			
14			Silty Clay: 25% silt, 5-10% fine-medium sand, <5% fine gravel, yellowish brown (10YR 5/3) and gray (10YR 5/1), low plasticity, v. stiff-hard, dry, some oxidation along fractures.	CL			Collected 3"x2" SS @ 4'-6' Drilled down to 6 feet
20		2.0	Silty Clay: 25% silt, 5-10% fine-medium sand, <5% small gravel, dark yellowish brown (10YR 4/6), low plasticity, v. stiff-hard, dry, no bedding, <u>Clay Till (?)</u>	CL			Collected 3"x2" SS @ 6-8 feet Drilled down to 8 feet
23		1.3	Silty Clay 20-25% silt, 5-10% fine-coarse sand, <5% fine gravel, grayish brown (10YR 5/2), low plasticity, hard, dry, no bedding, oxidation along fractures, <u>Clay Till</u> - gravel is angular; a large percentage is organic-rich black shale.	CL			Collected 3"x2" SS @ 8-10 Feet Drilled down to 10 feet
32			Silty Clay 25-30% silt, 5-10% fine-coarse sand, 5% fine gravel, transitional color from grayish brown (10YR 5/2) at top to dark gray (10YR 4/1) at bottom of interval, low plasticity, hard, dry, no bedding, <u>Clay Till</u>	CL			Collected 3"x2" SS @ 10-12 feet Drilled down to 12 feet
45		1.7	Silty Clay: 20-25% silt, 5% fine-medium sand, 5% fine-medium gravel, gray (10YR 5/1), medium plasticity, dry-slightly moist, v. stiff-hard, no apparent bedding, <u>Clay Till</u>	CL			Collected 3"x2" SS @ 12-14 feet Drilled down to 14 feet
52		2.0	Clay: w/silt 15-20%, 5-10% fine-medium sand, 5% fine-medium gravel (subangular-subrounded), dk gray (10YR 4/1), medium-high plasticity, dry, stiff, no apparent bedding, <u>Clay Till</u>	CL CH			Collected 3"x2" SS @ 14-16 feet Drilled down to 16 feet

Fort Sheridan RI/FS

Log of Well B126 MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
13	2.0			CP H			
22							
9			Silty Clay: 20-25% silt, 5-10% fine-medium sand, 5% fine-medium gravel (subangular-subrounded), dk gray (10YR 4/1), medium-high plasticity, medium stiff, dry-slightly moist, no apparent bedding, <u>Clay Till</u> .	CP H			Collected 3"x2' SS @ 16-18 feet Drilled down to 18 feet
14	2.0						
19							
23							
7			Silty Clay: 25-30% silt, 5-10% fine-medium sand, 5% fine-large gravel (subangular-subrounded), dk. gray (10YR 4/1), medium-high plasticity, medium stiff, dry, no apparent bedding, <u>Clay Till</u> .	CP H			Collected 3"x2' SS @ 18-20 feet Drilled down to 20 feet
13	2.0						
15							
20							
22							
5			Silty Clay: 20-25% silt, 5% fine-medium sand, 5% fine-medium gravel, dk. gray (10YR 4/1), medium-high plasticity, <u>silt</u> -medium stiff, dry-moist, no apparent bedding, <u>Clay Till</u> .	CP H			Collected 3"x2' SS @ 20-22 feet Drilled down to 22 feet
12	2.0						
15							
20							
5			Silty Clay: 20-25% silt, 5% fine-coarse sand, 5% fine-medium gravel, dk. gray (10YR 4/1), medium-high plasticity, soft-medium stiff, dry-slightly moist, no apparent bedding, <u>Clay Till</u> .	CP H			Collected 3"x2' SS @ 22-24 feet Drilled down to 24 feet
10	2.0						
13							
25							
9			Silty Clay: 20-25% silt, 5% fine-coarse sand, <5% fine-medium gravel, dk gray (10YR 4/1), medium-high plasticity, soft-medium stiff, dry-slightly moist, <u>Clay Till</u> .	CP H			Collected 3"x2' SS @ 24-26 feet
14	2.0						
20							
23							
30							<p>12/14/90 0.7" of H₂O in bottom of borehole. (Pulled back augers 2 feet yesterday before the end of the day) Measured the bottom of borehole = 23.6' BGL Began well installation. 12/14/90 15.00' casing (4 inch) 0.35' Bottom cap 10.00' Screen (4 inch, 10 slot) 1.5' Stick up Sandpack to 8.5' BGL - 6.5 Bags Bentonite Hole Plug 8.5' - 3.5' BGL 2.5 Bags Mixing Grout 3 Bags 94 lb Portland Type II 20 Gallons H₂O</p>

Log of Test Pit B216TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/20/91

Date Completed: 03/20/91

Total Depth of Trench: 13.7

Ground Elevation: 685.000

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/20/91	0824	1005	0	13.7






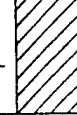
Abbreviations

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B216TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Fill Material: concrete	FM		
	Gravel: large crushed stone, few sand, light gray (10YR 7/1), nonplastic, wet, angular, <u>Fill</u>	GP		
	Clay: little silt, trace vegetation, dark gray (5Y 4/1) with areas of black (2.5Y N2/), low plasticity, soft, moist.	CL		
5	Clay: few silt, trace sand, gravel, and vegetation, yellowish brown (10YR 5/6) and gray (10YR 5/1) mottled, some areas of oxidation, low plasticity, hard, moist.	CL		
10	Clay: few silt, trace sand and gravel, yellowish brown (10YR 5/6) with few gray (10YR 6/1) mottling, low plasticity, hard, slightly moist.	CL		
15	Clay: little silt, few sand and gravel, dark gray (10YR 4/1), low plasticity, hard, slightly moist, <u>Glacial Till</u> .	CL		

Log of Boring MFPSB01

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Chuck Vermillion, Don Maki, ESE, Inc.

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Drilling Rig: CME 55 Truck Mounted Rig Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2' Split Spoon

Date Started: 1/25/91 Date Completed: 1/26/91 Total Depth Drilled: 33.7

Water Level While Drilling (bgl): DRY Ground Elevation: 691.185

Completion Information

Water Level At Completion (bgl): DRY Date: 1/26/91

Grout Interval: 0-32.9

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/25/91	1230	1700	0	20
1/26/91	0830	1230	20	34

Abbreviations

Abbr.	Meaning
HSA	hollow stem auger
trace	= < 5%
few	= 5-10%
little	= 15-25%
some	= 30-45%
mostly	= 50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Boring MFPSB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Topsoil; clay with sand and gravel; frozen.	NL			
9		1.6	Clay; trace fine gravel and silt, dark yellowish brown (10YR4/4) with mottles yellowish brown (10YR5/8) and very pale brown (10YR7/4), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS1 at 1-3' below ground level. Munsell color chart is referenced in the descriptions.
11				NL			
12		2.0	Clay; trace silt and fine gravel, brown (10YR 5/3) with mottles grey (10YR6/1) and yellowish brown (10YR5/8), low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS2.
14		2.0	Clay; trace silt, brown (10YR5/3), with mottles grey (10YR6/1) and yellowish brown (10YR5/8), low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS3. Hard Drilling
19		2.0	Clay; trace silt, brown (10YR5/3) changing to dark greyish brown at 9' below ground level few mottles grey (10YR6/1), low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS4.
20		2.0	Clay; trace silt, dark grey (10YR4/1) low plasticity, hard, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS5.
24		2.0	Clay; trace silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS6.
35		2.0	Clay; trace silt, dark grey (10YR4/1) low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS7. Slight amount of water between spoon and outside of sample.

Cement Grout







Fort Sheridan RI/FS

Log of Boring MFPSB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15							
21		2.0		CL			
29							
13			Clay; trace silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>				Collected SS8. Slight amount of water between spoon and outside of sample.
16		2.0		CL			
22							
24							
8			Clay; trace silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>				Collected SS9. Water on outside of sample but moist under surface of soil sample.
8		2.0		CL			
9							
20							
11			Clay; trace silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>				Collected SS10. Water on outside of sample but moist under surface of soil sample.
7							
8		2.0		CL			
11							
18							
9			Clay; trace silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>				Collected SS11. Water on outside of sample but moist under surface of soil sample.
14		2.0		CL			
20							
24							
7			Clay; little silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>				Collected SS12. Water on outside of sample but moist under surface of soil sample.
18				CL			
29							
37							
9			Clay; little silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>				Collected SS13. Water on outside of sample but moist under surface of soil sample.
20		2.0		CL			
27							
29							
8			Clay; little silt, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>				Collected SS14. Water on outside of sample but moist under surface of soil sample.
26		2.0		CL			
32							
30				CL			

Fort Sheridan RI/FS

Log of Boring MFPSB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
30							
13			Clay; little silt, small chunk bituminous shale, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Facial Till</u>	CL			Collected SS15. Trace amount of moisture between spoon and sample.
23	2.0						
33							
34			Clay; little silt, trace fine to medium gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Facial Till</u>	CL			Collected SS16. Trace amount of moist between spoon and sample.
10							
22	2.0						
27			Clay; little silt and trace fine to medium gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Facial Till</u>	CL			Collected SS17. Total depth of drill 33.7'. Grout borehole to surface.
35							
6							
35							
13	2.0						
24							
25							
							Grout Mix: 70 gallons water 9 bags Portland 1/2 bag bentonite gel
40							
45							

Log of Test Pit B126TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/19/91

Date Completed: 03/19/91

Total Depth of Trench: 14.0

Ground Elevation: 674.081

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/19/91	0834	0953	0	14

Abbreviations

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B126TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Fill Material: black asphalt	FM		
	Fill Material: crushed stone, light gray (10YR 7/1), nonplastic, moist.	FM		
	Sand: some gravel, dark grayish brown (10YR 4/2), nonplastic, wet, Fill	SP		
	Clay: little gravel, few sand, gray (5Y 5/1), low plasticity, firm, moist.	CL		
	Clay: little sand, few gravel, brown (10YR 4/3) with few gray (10YR 5/1), low plasticity, hard, slightly moist.	CL		
5				
	Clay: little silt, few sand, trace gravel, mottled brown (10YR 5/3) with few gray (10YR 6/1), hard, slightly moist.	CL		
10				
	Clay: little silt and gravel, few sand, gray (10YR 5/1), low plasticity, hard, dry.	CL		
15				

Log of Test Pit B126TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 530K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/18/91

Date Completed: 03/18/91

Total Depth of Trench: 14.0

Ground Elevation: 672.526

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/18/91	1435	1625	0	14

Abbreviations

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B126TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Clay: little silt, little sand, little vegetation, very dark gray (10YR 3/1), low plasticity, soft, moist. <u>Topsoil</u>	CL		asphalt is 0.2 feet thick at north end of trench
	Fill Material: crushed stone fill material	GP	fill material is 0.5 feet thick at north end of trench
	Clay: little silt, few sand, trace gravel, mottled, brownish yellow (10YR 6/6) with light gray (10YR 6/1), low plasticity, slightly moist.			
5		CL		
	Clay: some silt, few sand and gravel, mottled, pale brown (10YR 6/3) with little light gray (10YR 6/1), low plasticity, hard, slightly moist.	CL		
10	Clay: some silt, little gravel, trace sand, dark gray (10YR 4/1), low plasticity, hard, slightly moist.	CL		
15		CL		

Log of Test Pit MFPTP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/08/91

Date Completed: 03/08/91

Total Depth of Trench: 14.0

Ground Elevation: 692.202

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/08/91	0930	1350	0	14.0








Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit MFPTP1

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Fill Material: asphalt	FM		Sample taken at 2.5 feet
	Gravelly Sand: interbedded with a silty sand layer at 1.0 feet; strong brown sand (7.5YR 5/8) and brown silt (10YR 5/3), low plasticity, very loose, moist, subrounded to subangular gravel, <u>Fill Material</u> .	SP SM		
	Gravelly Sand: yellowish brown (10YR 5/8), low plasticity, very loose, moist, subrounded small gravel, <u>Fill Material</u> .	SW		
	Interbedded Silty Clay and Clayey Silt: few roots, few fist-sized cobbles, clay is mottled olive (5Y 4/4) and gray (5Y 5/1); silt is gray (10YR 5/1), low plasticity, moist, firm, subangular gravel, <u>Glacial Till</u> (Illuvial Eluvial Zone).	CL ML		
5	Silty Clay: few sand, few gravel, mottled, mostly yellowish brown (10YR 5/4), some gray (7.5YR 6/1), little dk brown (7.5YR 3/2), few strong brown (7.5YR 5/8) low plasticity, firm, moist, subangular gravel, <u>Glacial Till</u> .	CL		Sample taken at 7.0 feet
10				
	Clayey Silt: few sand, brown (10YR 5/3), low plasticity, moist, firm, <u>Glacial Till</u> .	ML		Sample taken at 14 feet below grade
	Clay: little silt, few gravel, slightly mottled, mostly dk gray (10YR 4/1), few yellowish red (5YR 5/8), some dk grayish brown (10YR 4/2), low plasticity, hard, moist, subrounded to subangular gravel, <u>Glacial Till</u> .	CL		
15				

Log of Test Pit MFPTP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Backhoe Operator & Company: Bob Bowman, ESE, Inc.	
Backhoe: Case 58CK	
Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts	
Date Started: 02/24/91	Date Completed: 02/24/91
Total Depth of Trench: 14.5	Ground Elevation: 691.126
Water Level While Trenching (bgl): 4	

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/24/91	0945	1201	0	14.5

Abbreviations

Abbr.	Meaning
FBG w/	Feet Below Grade with

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit MFPTP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Blacktop	FM		Sampled at 2.5 FBG
	Gravel and Sand Fill	FM		
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, yellowish brown (10YR 5/4), mottled with light gray (10YR 7/1), low plasticity, firm to hard, moist, homogeneous with vertical zones of gray, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		
	Clayey Sand: 75% sand, 25% clay, brown (10YR 5/3), nonplastic, medium dense, moist, homogeneous, grains angular to subrounded, <u>Small Fluvial Sediment Zone within Larger Ice Disintegration Scene</u> .	SC		
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, yellowish brown (10YR 5/4), mottled with light gray (10YR 7/1), low plasticity, hard, moist, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		
5	Sandy Clay with Gravel: 25% sand, 25% gravel, 50% clay, light olive brown (2.5Y 5/4), non-plastic, very loose, saturated, homogeneous, rounded to subrounded, <u>Outwash From Melting Glacier Tongue</u> .	CL		
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, dark grayish brown (10YR 4/2), medium to low plasticity, hard, moist, homogeneous, subrounded to subangular gravel, <u>Glacial Till</u> .	CL		
10				
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, gray (10YR 5/1), medium plasticity, hard, moist, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		
15				

Log of Test Pit B902TP1

Fort Sheridan RI/FS

Contract Number DAA15-90-D-0017

Geologist/Logger & Company: Jane M. Ballian, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/10/91

Date Completed: 03/10/91

Total Depth of Trench: 14

Ground Elevation: 685.150

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/10/91	1110	1410	0	14.0








Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Fort Sheridan RI/FS

Log of Test Pit B902TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Topsoil: little roots, little gravel, little sand, little clay, little silt, very dk gray (10YR 3/1), low plasticity, loose, moist, subangular gravel.	OL		
	Silty Clay and Clayey Gravel: interbedded silty clay and clayey gravel, few roots, some dk gray (10YR 4/1), some brown (10YR 5/3), few red (2.5YR 4/8), few yellowish red (5YR 5/3), few gray (10YR 5/1), low plasticity, firm, moist, subangular gravel, illuvial zone, <u>Glacial Till</u> .	GC		
	Clayey Silt: few gravel, few roots, slightly mottled, mostly yellowish brown (10YR 5/4), few gray (10YR 6/1), few strong brown (7.5YR 4/6), low plasticity, moist, soft, subrounded gravel, <u>Glacial Till</u> .	ML		sample taken at 3.0 feet
5	Silty Clay: few gravel, few roots, slightly mottled, mostly brown (10YR 4/3), little gray (10YR 6/1), little yellowish red (5YR 4/6), low plasticity, moist, firm, subrounded gravel, <u>Glacial Till</u> .	CL		
	Silty Clay: few gravel, few roots, mottled, some yellowish brown (10YR 5/4), some gray (10YR 5/1), few yellowish red (5YR 5/8), low plasticity, slightly moist, subrounded to subangular gravel, <u>Glacial Till</u> .	CL		sample taken at 7.0 feet
10	Silty Clay: few gravel, slightly mottled, mostly brown (10YR 5/3) with little gray (10YR 5/1), low plasticity, slightly moist, hard, subrounded gravel, <u>Glacial Till</u> .	CL		sample taken at 14.0 feet
15				

Log of Test Pit B902TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/10/91

Date Completed: 03/10/91

Total Depth of Trench: 14

Ground Elevation: 684.153

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/10/91	1500	1645	0	14.0

Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Fort Sheridan RI/FS

Log of Test Pit B902TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Topsoil: little roots, gravel, sand, clay, and silt, very dk gray (10YR 3/1), low plasticity, loose, moist, subangular gravel.	OL		
	Sandy Clay: little silt, few roots, few gravel, yellowish brown (10YR 5/4), low plasticity, firm, moist, subangular gravel. <u>Glacial Till</u> .	CL		
	Silty Clay: few gravel, roots, and sand, mottled, mostly yellowish brown (10YR 5/4), some gray (10YR 6/1), few red (2.5YR 4/8), low plasticity, firm, moist, rounded to subangular gravel. <u>Glacial Till</u> .			sample taken at 2.0 feet
5		CL		sample taken at 7.0 feet
10	Sandy Clay: little silt, few gravel, gray (10YR 6/1), low plasticity, moist, firm, subrounded gravel. <u>Glacial Till</u> .	CL		
	Clay: little silt, few gravel, dk gray (10YR 4/1), low plasticity, hard, moist, subrounded gravel. <u>Glacial Till</u> .	CL		sample taken at 14.0 feet
15				

Log of Test Pit B902TP3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/11/91

Date Completed: 03/11/91

Total Depth of Trench: 14

Ground Elevation: 690.795

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/11/91	0810	1100	0	14.0

Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
dk	dark
med	medium
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B902TP3

Depth (feet bgl)	Soil Description	USCS	Lithologic Log	Comments
		Classification		
0	Topsoil: some clay and silt, little sand and roots, few gravel, dk gray (10YR 3/1), low to med plasticity, loose, moist, subrounded gravel.	OL		
	Gravelly Clay: little roots and silt, few cobbles, mottled yellowish brown (10YR 5/4), few strong brown (7.5YR 5/8), little dark grayish brown (10YR 4/2), few red (2.5YR 4/8), low plasticity, moist very firm, subrounded to subangular gravel, <u>Glacial Till</u> .	CL		sample taken at 3.0 feet
	Silty Clay: few gravel, roots, and sand, slightly mottled, mostly brown (10YR 4/3), some dk yellowish brown (10YR 4/6), low plasticity, firm, moist, subangular gravel, <u>Glacial Till</u> .	CL		sample taken at 4.5 to 5.0 feet
5	Silty Clay: few gravel, few roots, mostly yellowish brown (10YR 5/4), little dk yellowish brown (10YR 4/6) (slightly mottled brown), and black (10YR 2/1); black and brown are interbedded, respectively, without any other differentiating physical characteristics; low to med plasticity, moist, firm, subrounded gravel, <u>Glacial Till</u> .	CL		
	Sandy Silt: few gravel, mottled, mostly brown (10YR 5/3), little red (2.5YR 4/6), little gray (10YR 6/1), few yellowish brown (10YR 5/8), low plasticity, moist to wet, wet at 12.0 feet, soft, subrounded gravel.	SM		sample taken at 8.0 feet
10				water encountered at 12.0 feet
	Silty Clay: few gravel, mottled, mostly brown (10YR 4/3), some gray (10YR 5/1), few black (2.5Y 2/0), low plasticity, hard, moist, subrounded to subangular gravel, <u>Glacial Till</u> .	CL		sample taken at 14.0 feet
15				

GEA 2

Log of Well LF2SB1/MW1

Fort Sheridan RI/FS

Contract Number DAAAS-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Drilling Rig: Brat I	Drilling Method: 6 1/4" HSA
Soil Sampling Device: Laskey Sampler	
Date Started: 01/24/91	Date Completed: 01/25/91
Total Depth Drilled: 40	
Water Level While Drilling (bgl): 33	Ground Elevation: 649.755

Completion Information

Water Level At Completion (bgl): 39.64	Date: 01/27/91
Screened Interval: 30 to 40	Filter Pack Interval: 25-40
Screen Length: 9.99	Bentonite Seal Interval: 19.6-25
End Cap Length: 0.15	Grout Interval: 0.0-19.6
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: 0.0 to -0.5
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.6
Total Casing: 32.67	Protective Casing Type: stick-up 6"
Top of Casing Elevation: 652.194	Protective Casing Length/AG: 5/2.5

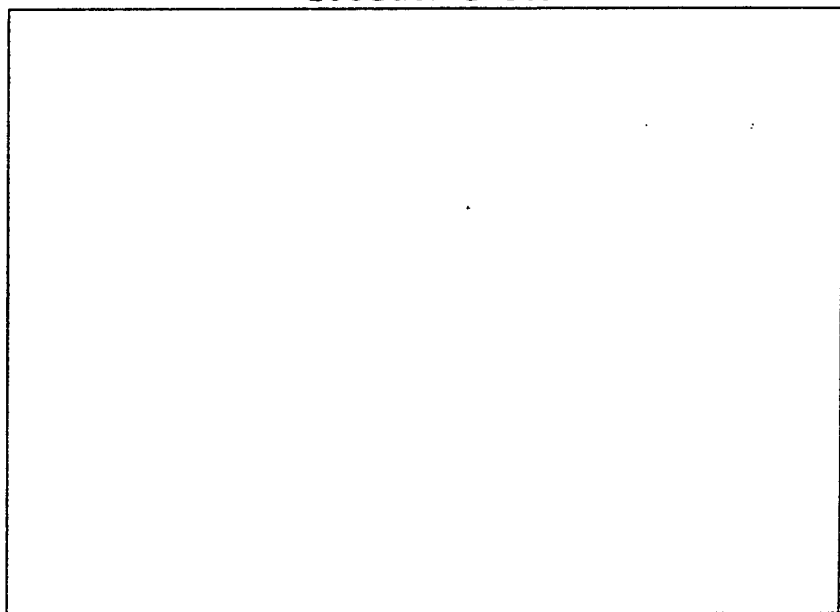
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
01/24/91	1520	1820	0	34.0
01/25/91	0924	1545	34	40

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	Hollow Stem Augers
PID	Photoionization Detector
NAB	Not Above Background



Fort Sheridan RI/FS

Log of Well LF2SB1/MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0						
2.4		Silty Clay with Gravel 5-10% silt, 10% gravel, yellowish brown (10YR5/4), nonplastic (frozen), hard, dense, dry to moist (at depth), no apparent bedding, massive, gravel subrounded to rounded, <u>Glacial Till</u>	CL			Sample on table at 1615 hours. PID reading on breathing zone is 0.0 Weather conditions: Clear with west winds at 5 mph, windchill temperature is -10 degrees F. Upper foot of sample is frozen.
5.0		Silty Clay with Gravel 5-10% silt, 1% gravel, yellowish brown (10YR5/6), medium plasticity, hard, dense, moist, no apparent bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1631 hours. PID reading of sample is 0.0 ppm.
10.0		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium to high plasticity, hard, dense, moist, no apparent bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1647 hours. PID reading of sample is 0.0 ppm.
15.0		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1702 hours. PID reading of sample is 0.0 ppm. Low recovery is due to large piece of fossiliferous limestone lodged in sampler nose.

Fort Sheridan RI/FS

Log of Well LF2SB1/MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
	2.5		CL		Cement	
20		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL		Hole Plug	Sample on table at 1723 hours. PID reading of sample is 0.0 ppm.
25		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1743 hours. PID reading of sample is 0.0 ppm. 1 inch thick silt layer at 24 feet.
	5.0		CL		Sand Pack	
30		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1800 hours. PID reading of sample is 0.0 ppm.

Fort Sheridan RI/FS

Log of Well LF2SB1/MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30	5.0		CL			
35		Silty Clay with Gravel: 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding, massive, gravel subrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1019 hours (01/25/91). PID reading of breathing zone is 0.0 ppm. PID reading of sample is 0.0 ppm. -200 94%
40		Silty Clay with Gravel: 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, dense, moist, no apparent bedding, massive, gravel surrounded to subangular, <u>Glacial Till</u>	CL			Sample on table at 1042 hours. PID reading of sample is 0.0 ppm.
45						

Log of Well LF02SB02/LF2MW02

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Chuck Vermillion, Mike Hebert, ESE, Inc.	
Geologist/Logger & Company: Andrew Granskog, ESE, Inc.	
Drilling Rig: CME 55 Truck Mounted Rig	Drilling Method: 6 1/
Soil Sampling Device: 3" x 2' Split Spoon	
Date Started: 1/13/91	Date Completed: 1/14/91
Total Depth Drilled: 24.97	
Water Level While Drilling (bgl): 12.69	Ground Elevation: 646.762

Completion Information

Water Level At Completion (bgl): 7.86	Date: 1/16/91
Screened Interval: 14.79-24.82	Filter Pack Interval: 7-24.92
Screen Length: 10.03	Bentonite Seal Interval: 3-7
End Cap Length: 0.15	Grout Interval: 0-3
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 17.11	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 650.182	Protective Casing Length/AG: 5/3.6

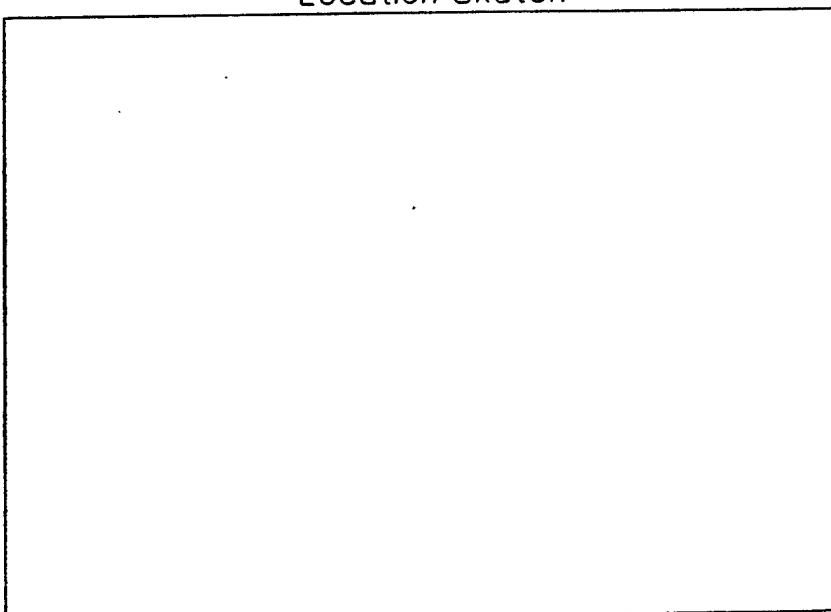
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/13/91	0930	1730	0	22
1/14/91	0845	1700	22	24

Abbreviations

Abbr.	Meaning
HSA	hollow stem auger
trace	= < 5%
few	= 5-10%
little	= 15-25%
some	= 30-45%
mostly	= 50-100%

Location Sketch



Fort Sheridan RI/FS

Log of Well LF02SB02/LF2MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction		Comments
						1.8'	3.4'	
0								
26			Clay: 0 to 0.8. Clay with gravel and sand (10YR4/4), dry fragments, glass and bricks, frozen, pieces of wood. 0.8 to 1.6. Building material, brick, stone (10YR7/1). 1.6 to 2.0. Clay with some fine to medium gravel, very dark grey (10YR3/1), medium plasticity, hard, slightly moist, no apparent bedding, subangular to angular grains <u>Glacial Till</u>	CL				Frost to 0.8 ft., hard drilling, building fragments and pieces of wood. Munsell color chart is referenced in the descriptions. Collected SS1.
36	2.0							
49								
30								
7			Clay: some fine to medium gravel and sand, trace silt, dark brown matrix with very dark brown (10YR2/2) at 0 to 2.4'. 2.4-4.0 ft. matrix is dark brown (10YR4/3) with mottles of olive yellow (2.5Y6/6) and olive brown (2.5Y4/4). Plasticity medium hard, no apparent bedding, angular grains, <u>Glacial Till</u>	CL				Collected SS2.
10	2.0							
16								
20								
10			Clay: little fine-medium gravel, trace silt and sand. Dark yellowish brown (10YR4/4) with mottles of light brownish grey (10YR6/2), medium plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL				Collected SS3.
16	2.0							
20								
27								
9			Clay: trace fine to medium gravel, trace silt and sand, brown (10YR4/3), medium plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL				Collected SS4.
19	2.0							
30								
43								
10			Clay: trace fine to medium gravel, trace silt, dark greyish brown (10YR4/2) with mottles gray (10YR6/1) and yellowish red (5YR5/8) medium plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL				Collected SS5. Hard drilling, no water encountered.
24	2.0							
35								
46								
9			Clay: trace fine to medium gravel, trace silt, dark grey (10YR4/3), mottles yellowish red (5YR5/8), medium plasticity, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL				Collected SS6. Very difficult drilling, few cobbles.
15	2.0							
18								
22								
5			Clay: trace fine to medium gravel with some large gravel, trace silt, dark grey (10YR4/1), medium plasticity, no apparent bedding, angular grains <u>Glacial Till</u>	CL				Collected SS7.
10	2.0							
14								
19								
5			Clay: trace fine to medium gravel with some large gravel, trace silt, dark grey (10YR4/1), medium plasticity, moist, no apparent bedding, angular grain <u>Glacial Till</u>	CL				Collected SS8.
7	2.0							

Fort Sheridan RI/FS

Log of Well LF02SB02/LF2MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
16	2.0			CL			
23				SP			Collected SS9. Encountered water 16 ft. below ground level.
11			Silty Sand; dark grey (10YR4/1) medium dense, saturated, subangular to subrounded.	SP			Static water level in auger 12.59 ft. below ground level. About 3 ft. of water in auger.
14	2.0		16.2-18 Clay; trace fine gravel, trace silt, dark grey, (10YR4/1) medium plasticity, moist Glacial Till	CL			
15				CL			
21				CL			Collected SS10. Confined conditions about 5 ft. of water in auger, no heave.
4			18-18.4 Clay; trace fine gravel, trace sand and silt. Dark grey (10YR4/1), medium plasticity, firm, moist.	CL			
9	2.0			SP			
16			18.4-19 Silty Sand; well sorted, dark grey, (10YR4/1), loose, saturated subangular	CL			
18			19-19.2 Clay; trace fine gravel, trace sand and silt. Dark grey (10YR4/1), medium plasticity, firm, moist.	SP			
20				SP			Collected SS11. About 5 ft. water in auger; no heave.
4			19.2-20 Silty Sand; well sorted, dark grey, (10YR4/1), loose, saturated, subangular.	SP			
8	2.0			SP			
15			Silty Sand; trace fine gravel, dark grey (10YR4/1), loose, saturated, subangular to subrounded.	SP			
23				CL			Collected SS12. When retrieving center bit prior to split spoon sampling, observed 10" of water in auger and auger dropped ~1 ft. at same time. Used auger shoe to stop downward travel and measured 2 ft. heave in auger. Put plastic bag over end of spoon to prevent heave from entering spoon. Retrieved bag portion inside spoon with spoon removal. Will set screen 15'-25'. At bottom of last spoon (22-24') firm clay. Prior to setting well, will drill 1 ft. into this clay to try to prevent heave. While setting well, Static water level in auger was 15.25 ft. below ground level. Water column 6.90'.
12			22-23 Clay; trace fine sand and silt, dark grey (10YR4/1), hard, moist.	CL			
14	1.5			SP			
24			23-23.8 Silty Sand; little fine gravel, dark grey (10YR4/1), loose, saturated.	SP			
26			23.8-24 Clay; trace fine sand and silt, dark grey (10YR4/1), firm, moist.	CL			
25							1/14/91 Static water level in auger 11.65'. Drilled to total depth 25'. Pulled center bit 2.5' heave, 13.5' water in augers. Sand pack to 7' below ground level. Holeplug to 3' below ground level, cement slurry and well guard. Total depth after cutoff 27.79', stickup 2.82'.
30							

Log of Boring LFO2 SB03

Fort Sheridan RI/FS

Contract Number DAA415-90-D-0017

Driller & Company: Pete Buell, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: Gus Peck Brat

Drilling Method: 4 1/4

Soil Sampling Device: Laskey Sampler

Date Started: 03/07/91 Date Completed: 03/08/91

Total Depth Drilled: 74

Water Level While Drilling (bgl):

Ground Elevation: 642.915

Completion Information

Water Level At Completion (bgl):

Date: 03/08/91

Grout Interval: C-74

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
03/07/91	1005	1655	0	74
03/08/91*	0810		-	-

Abbreviations

Location Sketch

Abbr.	Meaning
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Fort Sheridan RI/FS

Log of Boring LF02 SB03

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0		Sandy Gravel: 20% silt, <5% fine sand, black (IOYR 2/1), non-low plasticity, soft, dry, <u>Top Soil</u>	CL			03/07/91 1035 Start drilling down to 4' feet. Collected 0'-4' laskey sample OVM = 0.0 ppm
2.8		Clay: with silt, 10-15% <5% fine sand, yellowish brown (IOYR 5/6), low plasticity, stiff, dry, no apparent bedding.	CL			
4.5		Clay: with silt 10% and fine-coarse sand (angular, 5%, 5% small-medium gravel, dark yellowish brown (IOYR 4/6), low plasticity, stiff - v. stiff, dry, no apparent bedding, <u>Clay Till</u> - sampler @ 9' feet.	CL			Collected 4'-9' laskey sample OVM = 0.0 ppm
10		Silty Sand: fine, with clay 15-20% and <5% v. small gravel, dark yellowish brown (IOYR 4/6), v. loose-loose, dry-moist, no bedding, sand grains subrounded-subangular, no apparent bedding, -nonplastic	SM			Collected 9'-14' sample
15		Silty Sand: with clay 15-20%, <5% v. small gravel, sand is fine - v. fine grained, dark yellowish brown (IOYR 4/6), loose-medium dense, dry-moist, some oxidized laminations, sand is subrounded-subangular, non-plastic.	SM			Collected 14'-19' sample

Cement Grout

Fort Sheridan RI/FS

Log of Boring LF02 SB03

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15						
	2.5		SM			
20		Silty Sand: 30% silt, with clay 15-20%, sand is fine-v. fine grained, yellowish brown (10YR 5/8), non-plastic, dense, moist, no apparent bedding.	SM			1130 crew off site for lunch 1215 crew back on site Adjusting laskey sampler to increase recovery in sand Collected 19'-24' sample
	5.0					
		Clayey Silt: 30% clay, 15% v. fine-fine sand, dark gray (10YR 4/1), low plasticity - non plastic, soft, moist-saturated, no apparent bedding.	ML			
		Clay: with silt 15%, dark gray (10YR 4/1), low plasticity, v. stiff-hard, dry, no apparent bedding.	CL			
25		Clayey Silt: 40% clay, 15% v. fine-fine sand, dark gray (10YR 4/1), low plasticity, soft, moist-saturated, no apparent bedding	SM			Collected 24'-29' sample; 0 ppm OVM Drilling break @ 31 feet Drilling indicates interbedding from 31'-34' 0 ppm OVM Collected 31'-34' sample - 0 ppm = OVM
	5.0					
		Silty Clay: 20% silt, 5% fine-coarse sand, dark gray (10YR 4/1), low plasticity, v. stiff, dry, no apparent bedding.	CL			
	5.0					
		Clayey silt/silty clay interbedded and gradational.	CL			
30		Silty Clay: 30-35% silt, 5% v. fine sand, dark gray (10YR 4/1), low plasticity, stiff-v. stiff, moist-saturated.				

Cement Grout

Fort Sheridan RI/FS

Log of Boring LF02 SB03

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
30			CL			
5.0		Clayey Silt: 40% clay, 5% v. fine sand, dark gray (10YR 4/1), non plastic-low plasticity, soft, saturated, no apparent bedding.	ML			
		Silty Clay: 25-30% silt, trace, <5% fine sand, dark gray (10YR 4/1), low plasticity, stiff-v. stiff, moist-dry, no apparent bedding.	CL			
35		Silty Clay: 20% silt, 5% fine-coarse sand, 5-10% gravel (particularly @ 36-37.5' BGL), dark gray (10YR 4/1), low plasticity, dry, no apparent bedding, gravel is subangular-subrounded, Clay Till.	CL			Collected 34'-39' sample - 0 ppm = OVM
5.0			CL			
40		Clay: with silt, 15% and fine-coarse sand 5-10%, 5% small-med gravel (subangular-angular), dark gray (10YR 4/1), low plasticity, v. stiff-hard, dry, no apparent bedding, Clay Till.	CL			Collected 39'-44' sample OVM = 0.0 ppm
5.0			CL			
45		Clay: with silt 15%, 5% fine-coarse sand, 5% small-large gravel, dark gray (10YR 4/1), low plasticity, v. stiff-hard, dry, no apparent bedding, Clay Till (?)	CL			Drilling down to 49' Harder drilling this interval, per drill rotation pressure Easier Drilling 47-49' BGL

Fort Sheridan RI/FS

Log of Boring LF02 SB03

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
45						Collected 44'-49' sample QVM = 0.0 ppm
	5.0	Clayey Silt: 40% clay, <5% v. fine sand, gray (10YR 5/1), low plasticity, soft-medium stiff, moist-saturated, no apparent bedding.	CL			
		Silty Clay: 25-30% silt, <5% v. fine sand, dark gray (10YR 4/1), low plasticity, v. stiff, dry, no apparent bedding. <u>Clay Till</u>	CL			
50	4.5	Silty Clay: 20% silt, 5% small-large gravel, 5% fine-coarse sand, dark gray (10YR 4/1), medium plasticity, stiff, moist in some places, primarily dry, no apparent bedding. <u>Clay Till</u>	CL			Collected 49'-54' sample
		Silty Clay: 20% silt, 5% fine-coarse sand, 5-10% small gravel, dark gray (10YR 4/1), low-medium plasticity, stiff, dry, no apparent bedding or fabric. <u>Clay Till</u> (?)	CL			Collected 54'-59' sample
55	4.5					
	3.5	Clay: with silt 15%, 5% fine-coarse sand, 5% small gravel, dark gray (10YR 4/1), low-medium plasticity, stiff, dry, no apparent bedding or fabric. <u>Clay Till</u>	CL			Collected 59'-64' sample
60						

Cement Grout

Fort Sheridan RI/FS

Log of Boring LF02 SB03

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
60						
	3.5		CL			
65		Clay, with silt 10-15%, 5% fine sand, <5% small gravel, v. dark gray (10YR 3/1), low-medium plasticity, stiff, dry, no apparent bedding or fabric, <u>Clay Till</u>	CL			Collected 64'-69' sample
	5.0		CL			
70		Clay, with silt 10-15%, 5% fine sand, <5% small gravel, v. dark gray (10YR 3/1), medium plasticity, medium stiff-stiff, dry, no apparent bedding or fabric, <u>Clay Till (?)</u>	CL			Collected 69'-74' sample Off site for the day
	5.0		CL			
75						03/08/91 0810 crew onsite preparing to grout boring

Cement Grout

Log of Well LF2SB4/MW4d

Fort Sheridan RI/FS

Contract Number DAAA:5-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling		
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.		
Drilling Rig: CME 550 Track Mounted Rig		Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2' Split Spoon		
Date Started: 1/08/91		Date Completed: 1/09/91
		Total Depth Drilled: 31.0
Water Level While Drilling (bgl): 5.6		Ground Elevation: 588.250

Completion Information

Water Level At Completion (bgl): 23.0	Date: 1/09/91
Screened Interval: 19.95-29.98	Filter Pack Interval: 14.54-30.85
Screen Length: 10.03	Bentonite Seal Interval: 9.50-14.54
End Cap Length: 0.35	Grout Interval: 0-9.50
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 22.55	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 590.847	Protective Casing Length/AG: 5.0/2.75

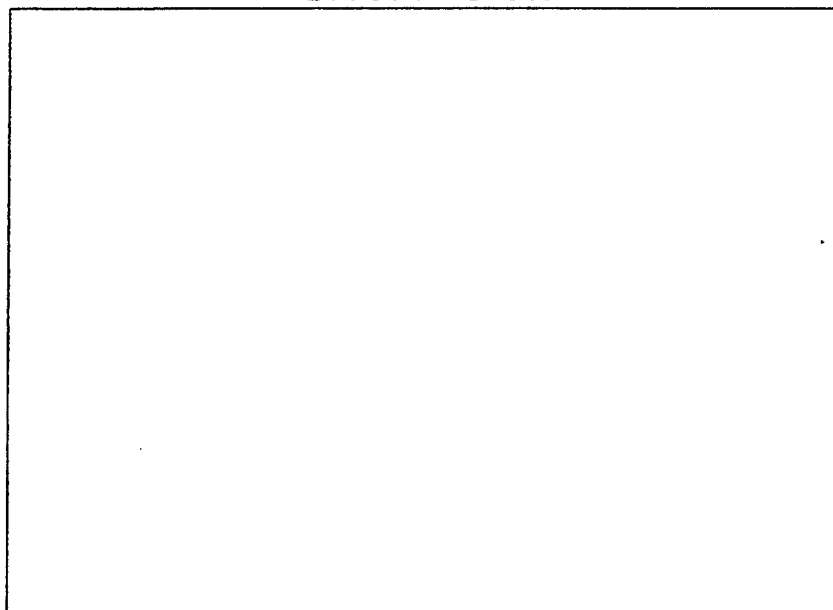
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/08/91	1045	1700	0	29
1/09/91	0947	1005	29	31

Abbreviations

Abbr.	Meaning
FM	fill material
NL	not logged
sched	schedule
PID	photoionization detector
ppm	parts per million
S P	Sand Pack

Location Sketch



Fort Sheridan RI/FS

Log of Well LF2SB4/MW4d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0							
23			Sand; medium, 10% medium to coarse gravel, very pale brown (10YR7/3), non-plastic, medium dense, moist, gravel and sand zone from 0.4 to 0.8 feet, clay seam from 1.4 to 1.5 feet, subrounded, Beach Deposit	SW			Weather at time of drilling was approximately 20°, breezy and overcast on January 8, 1991. Munseil color chart was referenced in each description. Frost zone was approximately 1.25 feet thick. Sample from 0 to 2 feet was obtained at 1049 hours.
22	1.87						
8							
3			Sand; medium, 10% medium to coarse gravel, very pale brown (10YR7/3), non-plastic, medium dense, subrounded, Beach Deposit	SW			Sample from 2 to 4 feet was obtained at 1117 hours. PID reading of the breathing air at 1130 hours was 0.0 ppm.
3							
8	1.81		Gravelly Sand; medium, 35% medium gravel, yellowish brown (10YR5/4), non-plastic, dense, moist, subrounded, Beach Deposit	GP			
14							
19			Gravelly Sand; medium, 35% medium gravel, yellowish brown (10YR5/4), non-plastic, very dense, saturated at 5.6 feet, rounded, Beach Deposit	SW			Sample from 4 to 6 feet was obtained at 1140 hours. Water was encountered at a depth of 5.6 feet. A cobble was present in the nose of the sampling spoon.
18							
22	2.0						
27							
39			Cobble; limestone	FM			Sample from 6 to 8 feet was obtained at 1200 hours. PID reading of the breathing air at 1200 hours was 0.0 ppm. There was a distinct change in drilling pressure upon changing from sand to clay.
10			Gravelly Sand; medium, 20% medium to coarse gravel, <5% clay, yellowish brown (10YR5/4), non-plastic, medium dense, saturated, subrounded, Beach Deposit	GC			
11	1.68						
8			Clay; 20% silt, 5% gravel, greyish brown (10YR5/2), medium plasticity, very hard, moist	CL			Sample from 8 to 10 feet was obtained at 1219 hours. PID reading of the breathing air at 1230 hours was 0.0 ppm.
16							
9			Clay; 15% silt, 5% small gravel, greyish brown (10YR5/2), medium plasticity, very hard, moist	CL			
14	1.65						
23							
27			Clay; 20% silt, <5% small gravel, dark grey (10YR4/1), high plasticity, hard, moist	CH			Sample from 10 to 12 feet was obtained at 1250 hours. PID reading of the breathing air at 1300 hours was 0.0 ppm. 1200 34%
5	1.40						
16							
28			Clay; 15% silt, <5% small gravel, grey (10YR5/1), high plasticity, hard, moist	CH			Sample from 12 to 14 feet was obtained at 1320 hours. PID reading of the breathing air at 1330 hours was 0.0 ppm.
5	1.84						
12							
17							
22			Clay; 30% silt, 15% small gravel, dark grey (10YR4/1), high plasticity, hard, moist	CH			Sample from 14 to 16 feet was obtained at 1337 hours.
6	1.98						
15							

Fort Sheridan RI/FS

Log of Well LF2SB4/MW4d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
5							
18	1.98			CH			
35							
6			Clay: 25% silt, <5% small gravel, dark grey (10YR4/1), high plasticity, hard, moist	CH			Sample from 16 to 18 feet was obtained at 1402 hours. PID reading of the breathing air at 1400 hours was 0.0 ppm.
12	1.9			CH			
20							
24			Clay: 25% silt, dark grey (10YR4/1), hard, moist, cobble from 19.6 to 19.8 feet	CL			Sample from 18 to 20 feet was obtained at 1429 hours. PID reading of the breathing air at 1430 hours was 0.0 ppm.
4							
12	2.0			CL			
18							
20			Interval was not sampled or logged	NL			No sample was obtained from 20 to 23 feet.
26							
5			Clay 30% silt, <5% small gravel, dark grey (10YR4/1), medium plasticity, hard, moist, a small seam from 23.25 to 23.75 feet had a silt content of 50%	CL			Sample from 23 to 25 feet was obtained at 1457 hours.
7	2.0						
8							
25			Clay: 40% silt, greyish brown (10YR5/2), high plasticity, firm, moist	CH			Sample from 25 to 27 feet was obtained at 1517 hours.
9							
10							
11	2.0			CH			
13							
22			Clay: 30% silt, 5% gravel, greyish brown (10YR5/2), firm, moist	CH			Sample from 27 to 29 feet was obtained at 1652 hours. Drilling was stopped for the day at 1700 hours after drilling to 29 feet.
3							
5	2.0			CH			
8							
10			Clay: 25% silt, 10% gravel, grey (10YR5/1), firm, moist	CH			Water level in the borehole was 23.0 feet at 0855 hours (1/09/91). Started drilling at 0947 hours on January 9, 1991.
5	1.61			CH			
30							

Log of Well LF2SB4/MW4d

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Log of Well LF2SB4/MW4s

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling		
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.		
Drilling Rig: CME 550 Track Mounted Rig		Drilling Method: 6 1/4" HSA
Soil Sampling Device:		
Date Started: 1/09/91	Date Completed: 1/09/91	Total Depth Drilled: 9.59
Water Level While Drilling (bgl): 5.5		Ground Elevation: 588.205

Completion Information

Water Level At Completion (bgl): 6.0	Date: 1/09/91
Screened Interval: 4.45-9.44	Filter Pack Interval: 3.25-9.59
Screen Length: 4.99	Bentonite Seal Interval: 1.55-3.25
End Cap Length: 0.15	Grout Interval: 0-1.55
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 7.06	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 590.858	Protective Casing Length/AG: 5.02/2.7

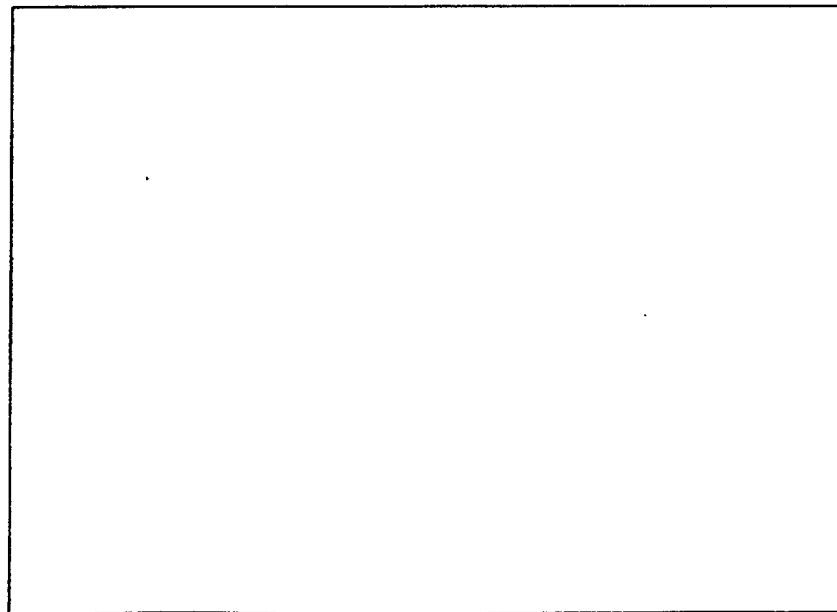
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/09/91*	1608	1645	0	9.59

Abbreviations

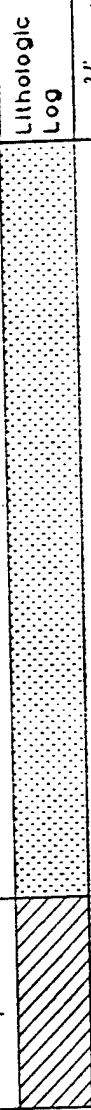
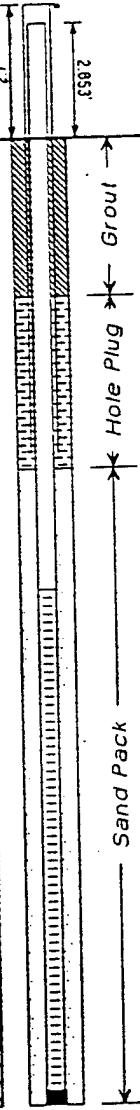
Location Sketch

Abbr.	Meaning
HSA	Hollow Stem Augers
sched	schedule



Fort Sheridan RI/FS

Log of Well LF2SB4/MW4s

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Sand: 10% small gravel, dark brown (10YR4/4), non-plastic, medium dense, saturated at 5.5 feet, gravel zones (medium in size) encountered at 2.0-2.5 feet and 5.5-6.0 feet, subrounded, Beach Deposit	SP			This boring log was compiled by examination of the soil cuttings with lithology changes based on changes in drilling pressure. No soil samples were obtained from this boring, but a detailed log for this area has been compiled for the nearby deep boring - LF2SB4d.
5		Clay: 20% silt, 5% small gravel, grayish brown (10YR5/2), medium plasticity, moist	CL			
10						
15						

Log of Boring LF2SB5d

Fort Sheridan RI/FS

Contract Number D-44A15-90-D-0017

Driller & Company: Barry Krause, Stearns Drilling

Geologist/Logger & Company: Michael Poznisk, ESE, Inc.

Drilling Rig: CME 550 Track Mounted Rig Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 1/10/91 Date Completed: 1/11/91 Total Depth Drilled: 40

Water Level While Drilling (bgl): 7.3 Ground Elevation: 590.473

Completion Information

Water Level At Completion (bgl): Dry Date: 1/11/91

Grout Interval: 0-40

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/10/91	1325	1702	0	36
1/11/91	0820	0925	36	40

Abbreviations

Abbr.	Meaning
NL	not logged
HSA	hollow stem augers

Location Sketch

Log of Boring LF2SB5d

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Fort Sheridan RI/FS

Log of Boring LF2SB5d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15							
7			Clay: 20% silt, <5% gravel, grey (10YR5/1), high plasticity, hard, moist	CH			Sample from 17 to 17 feet was obtained at 1445 hours.
13		1.37					
17							
23			Interval was not sampled or logged	NL			No sample was obtained from 17 to 20 feet. Drilling became easier at approximately 17.5 feet.
20							
6			Clay: 20% silt, 5% gravel, grey (10YR5/1), medium plasticity, hard, moist	CL			Sample from 20 to 22 feet was obtained at 1510 hours.
14		1.94					
17							
28			Interval was not sampled or logged	NL			No sample was obtained from 22 to 25 feet. A gravel zone was encountered at 22 feet.
25							
13			Clay: 15% silt, 5% gravel, dark grey (10YR4/1), medium plasticity, hard, moist	CL			Sample from 25 to 27 feet was obtained at 1530 hours.
21		2.0					
25							
34			Interval was not sampled or logged	NL			No sample was obtained from 27 to 30 feet. Drilling became easier at 29.5 feet.
30				CH			

Cement Grout

Fort Sheridan RI/FS				Log of Boring LF2SB5d			
Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
30							
7			Clay: 25% silt, dark grey (10YR4/1), high plasticity, firm, moist	CH			Sample from 30 to 32 feet was obtained at 1520 hours.
9	2.0						
12							
13			Clay: 15% silt, 10% medium gravel, <5% sand, dark grey (10YR4/1), high plasticity, firm, moist	CH			Sample from 32 to 34 feet was obtained at 1640 hours.
4							
7	1.95						
11							
12			Clay: 15% silt, 5% gravel, <5% sand, dark grey (10YR4/1), high plasticity, firm, moist	CH			Sample from 34 to 36 feet was obtained at 1655 hours. Stopped drilling for day.
4							
7	2.0						
11							
17			Clay: 15% silt, 10% gravel, dark grey (10YR4/1), medium plasticity, hard, moist	CL			January 11, 1991 - weather 25° with freezing drizzle. Sample from 36 to 38 feet was obtained at 0910 hours.
9							
19	1.98						
26							
32			Clay: 10% silt, 5% gravel, grey (10YR5/1), high plasticity, hard, moist	CH			Sample from 38 to 40 feet was obtained at 0920 hours. Drilling was completed at 40 feet. Boring was grouted to surface with a cement grout. A boring was then drilled nearby to allow the small gravel seams to be screened (LF2MW5d).
10							
22	2.0						
29							
40	44						

Log of Well LF2SB5/MW5s

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: CME 850 Track Mounted Rig

Drilling Method: 6 1/4" HSA

Soil Sampling Device:

Date Started: 1/12/91

Date Completed: 1/12/91

Total Depth Drilled: 11.29

Water Level While Drilling (bgl): 7.5

Ground Elevation: 590.365

Completion Information

Water Level At Completion (bgl): 7.8	Date: 1/12 /91
Screened Interval: 5.95-10.94	Filter Pack Interval: 4.12-11.29
Screen Length: 4.99	Bentonite Seal Interval: 2.06-4.12
End Cap Length: 0.35	Grout Interval: 0 to 2.06
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 8.67	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 593.100	Protective Casing Length/AG: 5.02/2.90

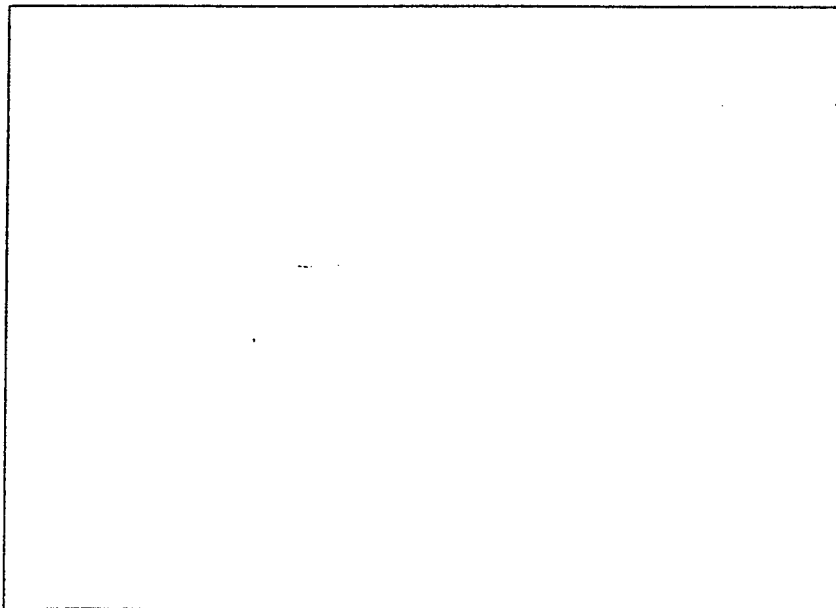
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/12/91	1300	1400	0	11

Abbreviations

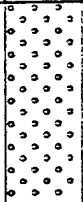
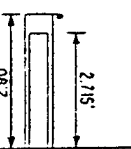
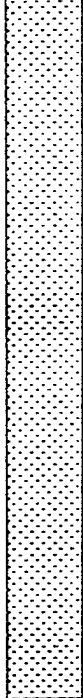
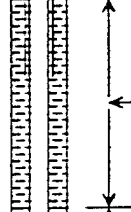
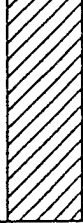
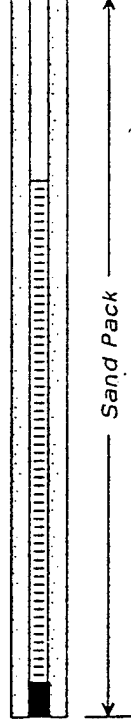
Location Sketch

Abbr.	Meaning
HSA	hollow stem augers



Fort Sheridan RI/FS

Log of Well LF2SB5/MW5s

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Sand: very pale brown (10YR7/4), non-plastic, medium dense, dry, well rounded. <u>Beach Deposit</u>	SW			This boring log was compiled by examination of the soil cuttings with lithology changes based on changes in drilling pressure. No soil samples were obtained from this boring, but a detailed log for this area has been compiled for the nearby deep boring - LF2SB05d.
5		Gravelly Sand: 20% gravel, brown (10YR5/3), non-plastic, medium dense, saturated at 7.5 feet, rounded. <u>Beach Deposit</u>	SP			
10		Clay: 20% silt, 5% gravel, grey (10YR5/1), medium plastic, moist	CL			
15						

Log of Well LF2SB5/MW5d

Fort Sheridan RI/FS

Contract Number DA-A15-90-D-0017

Driller & Company: Barry Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 85C Track Mounted Rig	Drilling Method: 6 1/4" HSA
Soil Sampling Device:	
Date Started: 1/11/91	Date Completed: 1/11/91
Total Depth Drilled: 28	
Water Level While Drilling (bgl): 7.0	Ground Elevation: 590.476

Completion Information

Water Level At Completion (bgl): Dry	Date: 1/12/91
Screened Interval: 17.44-27.47	Filter Pack Interval: 12.86-27.81
Screen Length: 10.03	Bentonite Seal Interval: 7.76-12.86
End Cap Length: 0.34	Grout Interval: 0-7.76
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 20.14	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 593.178	Protective Casing Length/AG: 5.01/2.95

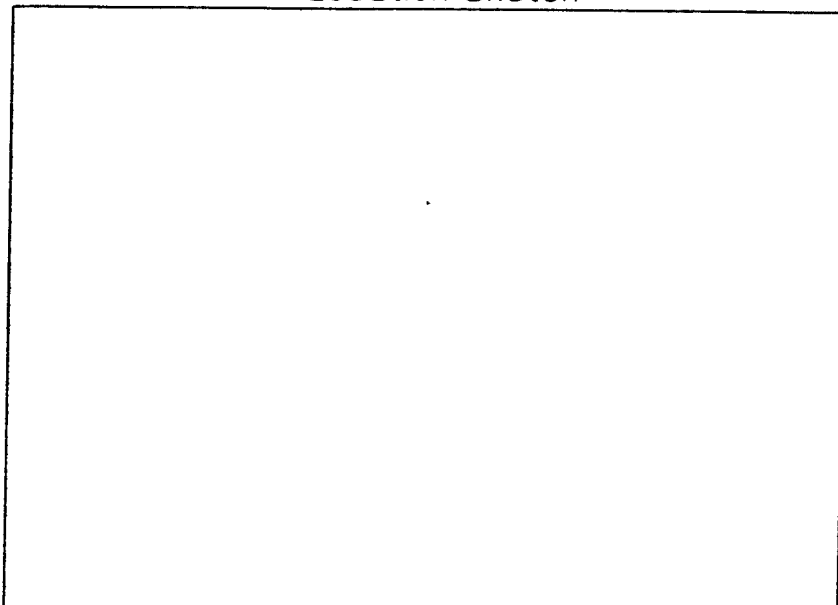
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/11/91	1400	1530	0	28

Abbreviations


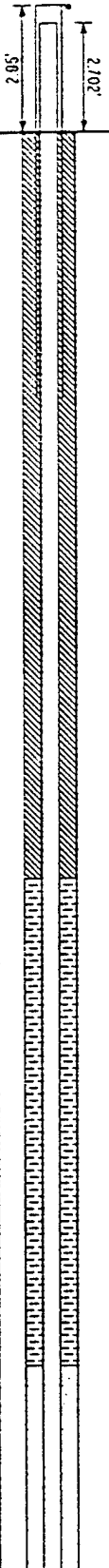
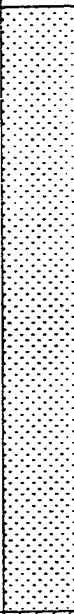

Abbrev.	Meaning
HSA	hollow stem auger

Location Sketch



Fort Sheridan RI/FS

Log of Well LF2SB5/MW5d

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Sand: very pale brown (10YR7/4), non-plastic, dry, well rounded. <u>Beach Deposit</u>	SW			This boring log was compiled by examination of the soil cuttings with lithology changes based on changes in drilling pressure. No soil samples were obtained from this boring, but a detailed log for this area has been compiled for the nearby boring - LF2SB05c. Munsell color chart is referenced in each description.
5		Gravelly Sand: 20% gravel, brown (10YR5/3), non-plastic, saturated at 7.0 feet, round. <u>Beach Deposit</u>	SP			
10		Clay: 20% silt, 5% gravel, grey (10YR5/1), medium plastic, moist	CL			
15						

Fort Sheridan RI/FS

Log of Well LF2SB5/MW5d

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS	Lithologic	Well Construction	Comments
			Classification	Log		
15						
20			CL			Drilling became easier at a depth of 7.5 feet.
25						Gravel was encountered at a depth of 22 feet.
30						Drilling became harder at a depth of 27 feet.

Log of Well LF2SB6/MW6s

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: CME 350 Track Mounted Rig Drilling Method: 6 1/4" HSA

Soil Sampling Device:

Date Started: 1/13/91 Date Completed: 1/13/91 Total Depth Drilled: 8.85

Water Level While Drilling (bgl): 6.5 Ground Elevation: 587.952

Completion Information

Water Level At Completion (bgl): 7.72	Date: 1/13/91
Screened Interval: 3.92-8.50	Filter Pack Interval: 3.01-8.85
Screen Length: 4.93	Bentonite Seal Interval: 1.48-3.01
End Cap Length: 0.35	Grout Interval: 0-1.48
Screen Type/Dia.: "O slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 6.32	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 590.745	Protective Casing Length/AG: 5.02/3.1

Drilling Shifts

Date	Time	Depth of Drilling Per Shift
Start	End	Start End
1/13/91*	1630 1715	0 8.85

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	hollow stem augers

Log of Well LF2SB6/MW6s

B - 80

Log of Well LF2SB6/MW6d

Fort Sheridan RI/FS

Contract Number DAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: CME 350 Track Mounted Rig Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 1/13/91 Date Completed: 1/13/91 Total Depth Drilled: 24

Water Level While Drilling (bgl): 15 Ground Elevation: 588.109

Completion Information

Water Level At Completion (bgl): 21.0	Date: 1/13/91
Screened Interval: 13.24-23.26	Filter Pack Interval: 10.20-23.61
Screen Length: 10.32	Bentonite Seal Interval: 5.04-10.20
End Cap Length: 0.35	Grout Interval: 0-5.04
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 15.97	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 590.839	Protective Casing Length/AG: 5.01/2.33

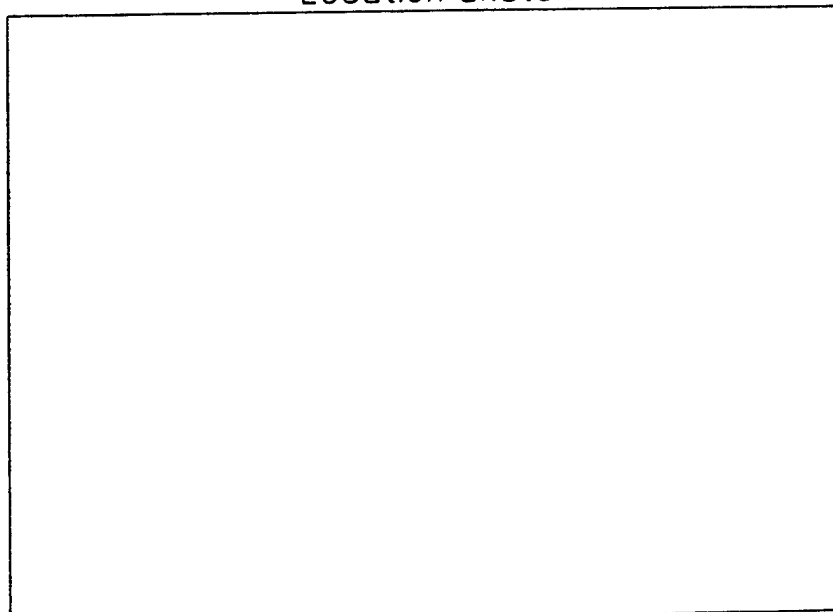
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/13/91	0845	1423	0	24

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	hollow stem augers



Fort Sheridan RI/FS

Log of Well LF2SB6/MW6d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0							
13			Sand: fine grained, pale brown (10YR6/3), non-plastic, medium dense, moist (frozen), rounded, Beach Deposit	SW			Sample from 0 to 2 feet was obtained at 0850 hours. There was 1.09 feet of frost. Munsell color chart is referenced in each description.
10		2.0	Gravel: medium, brown (10YR5/3), non-plastic, medium dense, dry, rounded, Beach Deposit	GW			
8			Gravelly Sand: 35% gravel dark brown (10YR4/3), non-plastic, medium dense, moist, subrounded, Beach Deposit	SW			Sample from 2 to 4 feet was obtained at 0915 hours.
10			Gravelly Sand: 35% sand to medium gravel, light yellowish brown (10YR6/4), non-plastic, medium dense, moist, rounded, Beach Deposit	SP			
5		1.97					
9							
13							
13			Gravelly Sand: fine to medium, 40% small to medium gravel, dark yellowish brown (10YR4/4), non-plastic, very dense, saturated at 5.5 feet, rounded, Beach Deposit	SP			Sample from 4 to 6 feet was obtained at 0925 hours. Sand was saturated at 5.5 feet.
9		2.0					
17							
19							
26			Gravelly Sand: fine to medium, 35% small gravel, dark yellowish brown (10YR4/4), non-plastic, saturated, rounded, Beach Deposit	SP			Sample from 6 to 8 feet was obtained at 0945 hours. Clay was encountered at 6.7 feet.
9							
11		1.94	Clay: 15% silt, <5% small gravel, grey (10YR5/1), medium plasticity, hard, moist	CL			
14							
16			Clay: 20% silt, 10% gravel, <5% sand, dark grey (10YR4/1), low plasticity, very hard, moist	CL			Sample from 8 to 10 feet was obtained at 1000 hours.
5							
13		0.84					
19							
24			Clay: 20% silt, <5% gravel, dark grey (10YR4/1), medium plasticity, hard, moist	CL			Sample from 10 to 12 feet was obtained at 1025 hours.
8							
12		2.0					
21							
25			Clay: 15% silt, <5% gravel, dark grey (10YR4/1), medium plasticity, hard, moist	CL			Sample from 12 to 14 feet was obtained at 1040 hours.
6							
10		1.68					
15							
20			Clay: 15% silt, 5% gravel, dark grey (10YR4/1), medium plasticity, hard, moist, saturated gravel zone located from 15.0 to 15.4 feet	CL			Sample from 14 to 16 feet was obtained at 1115 hours. Saturated gravel zone located from 15.0 to 15.4 feet.
16		2.0					
12							

Fort Sheridan RI/FS

Log of Well LF2SB6/MW6d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
17	2.0			CL			
19							
5			Clay: 15% silt, 0% gravel (predominately located from 16 to 17 feet); dark grey (10YR4/1), high plasticity, soft	CH			Sample from 16 to 18 feet was obtained at 1140 hours. Drilling was easier through this interval.
6	2.0						
7							
13							
5			Clay: 15% silt, dark grey (10YR4/1), high plasticity, firm, moist	CH			Sample from 18 to 20 feet was obtained at 1155 hours.
8	2.0						
10							
20							
13			Clay: 25% silt, <5% gravel, dark grey (10YR4/1), high plasticity, firm, moist	CH			Sample from 20 to 22 feet was obtained at 1400 hours.
6							
7	1.78						
12							
15							
4			Clay: 15% silt, dark grey (10YR4/1), high plasticity, hard, moist	CH			Sample from 22 to 24 feet was obtained at 1410 hours.
7	1.83						
13							
18							
25							
30							

Log of Well LF2SB7/MW7d

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: CME 550 Track Mounted Rig Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2' Split Spoon

Date Started: 1/14/91 Date Completed: 1/15/91 Total Depth Drilled: 34

Water Level While Drilling (bgl): 5.0 Ground Elevation: 586.74'

Completion Information

Water Level At Completion (bgl): 15.4	Date: 1/15/91
Screened Interval: 21.95-31.98	Filter Pack Interval: 17.41-32.33
Screen Length: 10.03	Bentonite Seal Interval: 12.46-17.41
End Cap Length: 0.35	Grout Interval: 0-12.46
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 24.32	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 589.535	Protective Casing Length/AG: 5.01/3.1

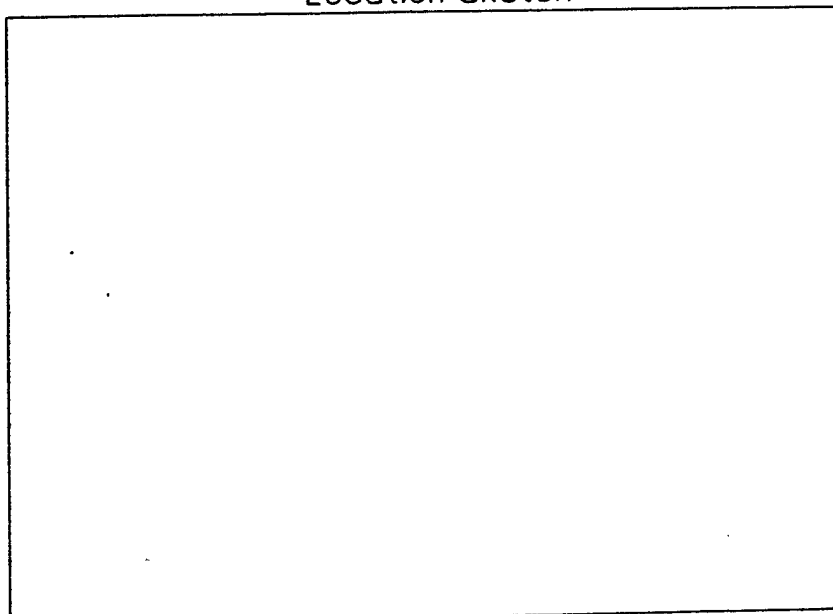
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/14/91	1300	1700	0	26
1/15/91*	0845	0950	26	34

Abbreviations

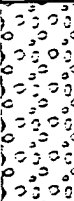
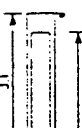


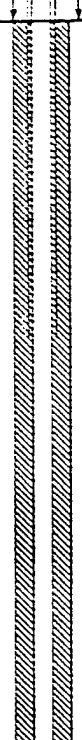
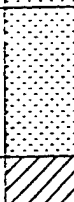





Abbr.	Meaning
HSA	hollow stem auger

Location Sketch



Fort Sheridan RI/FS

Log of Well LF2SB7/MW7d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Gravel: medium to large, various colors, non-plastic, dry, rounded. <u>Beach Deposit</u>	GW			The interval from 0 to 2 feet was not sampled due to the presence of large gravel.
4			Gravelly Sand: 30-50% gravel, light olive brown (2.5Y5/6), non-plastic, very dense, moist, rounded. <u>Beach Deposit</u>	SP			Sample from 2 to 4 feet was obtained at 1320 hours. Munsell color chart is referenced in descriptions. Zones throughout the sampling spoon have varying amounts of gravel. The sand and gravel are medium to large in size.
42	1.89		Gravelly Sand: 35% small to large gravel, yellowish brown (10YR5/4), non-plastic, dense, gravel seam from 5.1 to 5.2 feet, saturated at 5.0 feet, rounded. <u>Beach Deposit</u>	SP			Sample from 4 to 6 feet was obtained at 1335 hours. The sand was saturated at a depth of 5.0 feet.
32			Gravelly Sand: 35% small to medium gravel, brown (10YR5/3), non-plastic, dense, saturated, cobble from 6.9 to 7.1 feet, subrounded. <u>Beach Deposit</u>	SP			Sample from 6 to 8 feet was obtained at 1355 hours. Clay was encountered at 7.5 feet.
24			BClay: 15% silt, grey (10YR5/1), high plasticity, firm, moist	CH			Sample from 8 to 10 feet was obtained at 1415 hours.
6			Clay: 15% silt, dark grey (10YR4/1), high plasticity, firm, moist	CH			Sample from 10 to 12 feet was obtained at 1435 hours.
11	1.94		Clay: 15% silt, 5% small gravel, dark grey (10YR4/1), high plasticity, hard, moist	CH			Sample from 12 to 14 feet was obtained at 1455 hours. 2:00 PM
14			Clay: 15% silt, 5% small gravel, dark grey (10YR4/1), medium plasticity, hard, moist	CL			Sample from 14 to 16 feet was obtained at 1520 hours.
28			Clay: 15% silt, 10% small to medium gravel, dark grey (10YR4/1), high plasticity, hard, moist	CH			
19							
7							
3							
6	1.59						
12							
19							
6							
9	1.80						
14							
16							
4							
9	2.0						
12							
16							
6							
2.0							
10							
15							


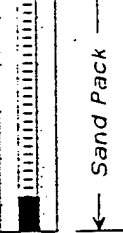
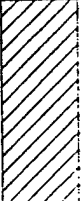
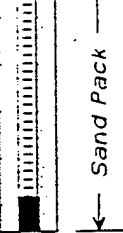
Fort Sheridan RI/FS

Log of Well LF2SB7/MW7d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
14	2.0			CH			
19							
4			Clay: 15% silt, 5% sand, <5% gravel, dark grey (10YR4/1), medium plasticity, hard, moist				Sample from 16 to 18 feet was obtained at 1540 hours.
11	1.75			CL			
12							
18							
4			Clay: 10% silt, 5% gravel, <5% sand, dark grey (10YR4/1), medium plasticity, hard, moist				Sample from 18 to 20 feet was obtained at 1600 hours. Sample had a vertical joints filled with sand.
7	2.0			CL			
11							
20							
17			Clay: 15% silt, 10% gravel, dark grey (10YR4/1), high plasticity, firm, moist				Sample from 20 to 22 feet was obtained at 1615 hours.
6							
10	1.98			CH			
12							
17							
4			Clay: 15% silt, 5% gravel, dark grey (10YR4/1), medium plasticity, hard, moist				Sample from 22 to 24 feet was obtained at 1640 hours.
7	2.0			CL			
10							
15							
7			Clay: 10% silt, 5% gravel, dark grey (10YR4/1), medium plasticity, hard, moist				Sample from 24 to 26 feet was obtained at 1655 hours. Silt was observed in the nose cone of the split spoon. The drilling operation was stopped for the day.
9	2.0			CL			
13							
18							
9			Clay: 10% silt, <5% gravel, dark grey (10YR4/1), high plasticity, hard, moist				Drilling resumed at 0845 hours on January 15, 1991. The weather was approximately 30°. Sample from 26 to 28 feet was obtained at 0850 hours.
12	2.0			CH			
14							
17							
5			Clay: 15% silt, 5% gravel, grey (10YR5/1), medium plasticity, hard, moist				Sample from 28 to 30 feet was obtained at 0905 hours.
8	2.0			CL			
11							
30				CL			

Fort Sheridan RI/FS

Log of Well LF2SB7/MW7d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30							
4			Clay; 20% silt, 10% gravel, grey (10YR5/1), medium plasticity, hard for most of split spoon except it is soft from 31.5 to 32 feet, moist	CL			Sample from 30 to 32 feet was obtained at 0930 hours.
8	2.0						
16							
32			Clay; 10% silt, 10% gravel, dark grey (10YR4/1), medium plasticity, hard, moist	CL			Saturated silt was encountered from 31.8 to 32 feet. Sample from 32 to 34 feet was obtained at 0949 hours.
8							
14	2.0						
22							
34							
35							
40							
45							

Log of Well LF2SB7/MW7s

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 550 Track Mounted Rig	Drilling Method: 6 1/4" HSA
Soil Sampling Device:	
Date Started: 1/21/91	Date Completed: 1/21/91
Total Depth Drilled: 8.53	
Water Level While Drilling (bgl): 4.5	Ground Elevation: 586.565

Completion Information

Water Level At Completion (bgl): 4.96	Date: 1/21/91
Screened Interval: 3.19-8.18	Filter Pack Interval: 3.03-8.53
Screen Length: 4.99	Bentonite Seal Interval: 1.56-3.03
End Cap Length: 0.35	Grout Interval: 0-1.56
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 5.69	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 589.271	Protective Casing Length/AG: 5.01/3.0

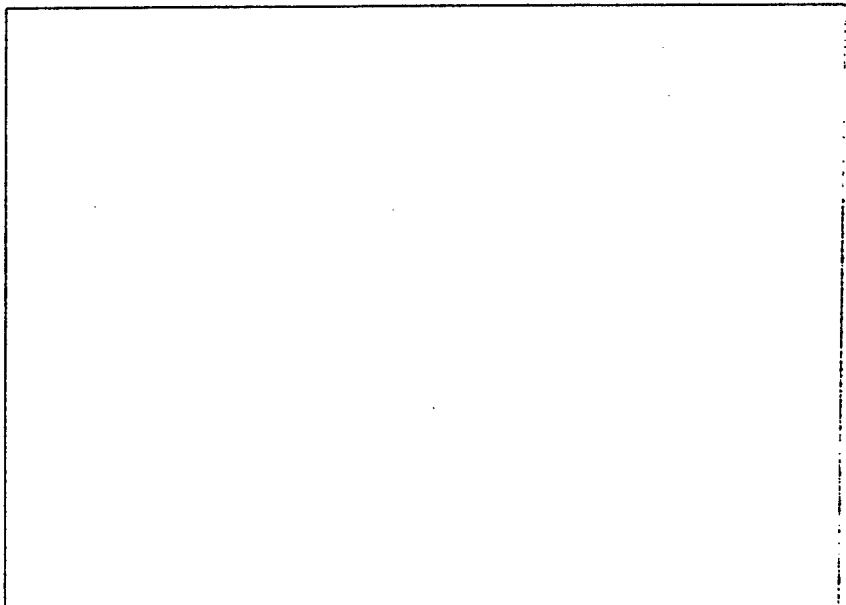
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/21/91	1535	1600	0	8.53

Abbreviations

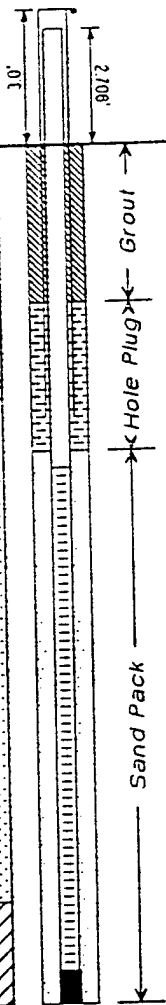

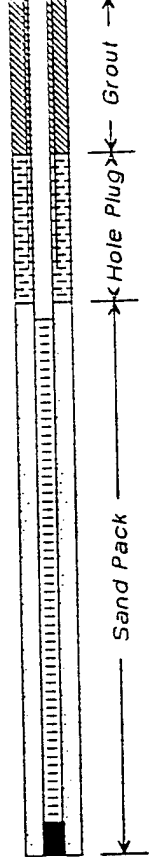


Abbr.	Meaning
HSA	hollow stem augers

Location Sketch



Fort Sheridan RI/FS

Log of Well LF2SB7/MW7s

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
						
0		Cobble: medium to large, various types and colors, nonplastic, <u>Beach Deposit</u>	GW			This boring log was compiled by examination of the soil cuttings with lithology changes based on changes in drilling pressure. No soil samples were obtained from this boring, but a detailed log for this area has been compiled for the nearby boring - LF2SB07a
5		Gravelly Sand: 30-60% gravel, brown (10YR5/3), non-plastic, moist, rounded, <u>Beach Deposit</u>	SP			A cobble was encountered from 2.5 to 3.5 feet.
10		Clay: 5% silt, grey (10YR5/1), high plasticity, firm, moist	CH			The sand was saturated at a depth of 4.5 feet.
15						

Log of Well LF2SB8/MW8d

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Carr. Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 550 Track Mounted	Drilling Method: 6 3/4" HSA
Soil Sampling Device: 3" x 2' Split Spoon	
Date Started: 7/23/91	Date Completed: 7/23/91
Total Depth Drilled: 32	
Water Level While Drilling (bgl): 5.15	Ground Elevation: 584.3553

Completion Information

Water Level At Completion (bgl): 10.37	Date: 7/23/91
Screened Interval: 19.47-29.46	Filter Pack Interval: 14.2-29.82
Screen Length: 9.93	Bentonite Seal Interval: 9.2-14.2
End Cap Length: 0.33	Grout Interval: 0-9.2
Screen Type/Dia.: 3 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 22.3	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 587.242	Protective Casing Length/AG: 5.02/3.4

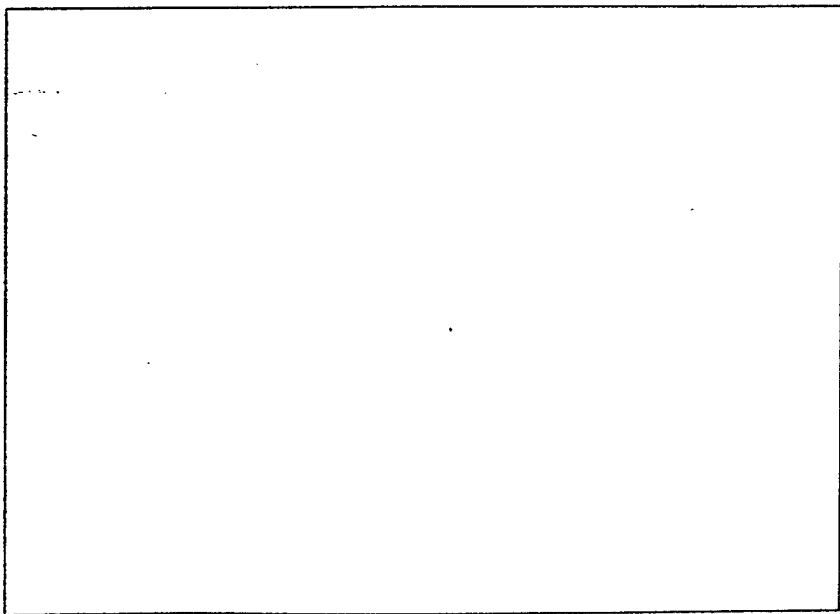
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/23/91	0915	1435	0	32

Abbreviations

Abbr.	Meaning
HSA	hollow stem augers
FM	fill material
Some	>25-35%
little	>15-25%
few	>5-10%
trace	>5%
PID	photoionization detector
ppm	parts per million

Location Sketch



Fort Sheridan RI/FS

Log of Well LF2SB8/MW8d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Sand: some gravel, few fines, brown (10YR5/3), non-plastic, medium dense, rounded, dry, <u>Beach Deposit</u>	SP		Cement Grout	Sample from 0 to 2 feet was obtained at 0915 hours. Headspace reading of the sample using a PID was 0.0 ppm. Munsell color chart is referenced in the descriptions.
4		2.0	Gravelly Sand: sand to medium gravel, few fines (silt and clay), non-plastic, medium dense, rounded, moist, <u>Beach Deposit</u>	SW			
8			Gravelly Sand: sand to medium gravel, few fines (silt and clay), non-plastic, rounded, moist, <u>Beach Deposit</u>	SW			Sample from 2 to 4 feet was obtained at 0935 hours. Headspace reading of the sample using a PID was 0.0 ppm.
15			Cobble: limestone, <u>Fill Material</u>	FM			
23			Sand: few gravel, few fines (silt and clay), brown (10YR5/3), non-plastic, rounded, saturated at 5.5 feet, <u>Beach Deposit</u>	SP			Sample from 4 to 6 feet was obtained at 1015 hours. Headspace reading of the sample using a PID was 0.0 ppm.
3		2.0	Gravelly Sand: sand to medium gravel, few fines, non-plastic, medium dense, saturated, <u>Beach Deposit</u>	SW			
13			Gravelly Sand: sand to medium gravel, few fines (silt and clay), non-plastic, medium dense, saturated, <u>Beach Deposit</u>	SW			Sample from 6 to 8 feet was obtained at 1025 hours. Headspace reading of the sample using a PID was 0.0 ppm.
18			Clay: some silt, little sand to medium gravel, trace sand, grey (10YR5/1), hard, slightly moist to dry	CL			
18			Clay: some silt, little gravel, trace sand, grey (10YR5/1), hard, moist	CL			Sample from 8 to 10 feet was obtained at 1040 hours. Headspace reading of the sample using a PID was 0.0 ppm.
3		1.0	Clay: some silt, little medium gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist	CL			
9			Clay: some silt, little medium to large gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist	CL		Bentonite Hole Plug	Sample from 10 to 12 feet was obtained at 1050 hours. Headspace reading for the sample using a PID was 0.0 ppm.
15							
25							Sample from 12 to 14 feet was obtained at 1100 hours. Headspace reading for the sample using a PID was 0.0 ppm.
9		2.0					
17							
22						id Pack	Sample from 14 to 16 feet was obtained at 1110 hours. Headspace reading for the sample using a PID was 0.0 ppm.
30							
6		2.0					
13							
19							
26							
7		2.0					
12							

Fort Sheridan RI/FS


Log of Well LF2SB8/MW8d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
18	2.0			CL			
27							
8			Clay: some silt, little gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist, gravel becomes larger at 17.5 feet				Sample from 16 to 18 feet was obtained at 1120 hours. Headspace reading for the sample using a PID was 0.0 ppm.
13	2.0			CL			
19							Gravel was encountered at 17.5 feet.
25							
10			Clay: some silt, some medium gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist				Sample from 18 to 20 feet was obtained at 1305 hours. Headspace reading for the sample using a PID was 0.0 ppm.
14	2.0			CL			
19							
20							
26			Clay: some silt, few gravel, trace sand, grey (10YR5/1), low plasticity, firm to soft, very moist				Sample from 20 to 22 feet was obtained at 1315 hours. Headspace reading for the sample using a PID was 0.0 ppm.
3				CL			
6	2.0						
11			Clay: some silt, some gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist				
17				CL			
7			Clay: some silt, few gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist				Sample from 22 to 24 feet was obtained at 1325 hours. Headspace reading for the sample using a PID was 0.0 ppm.
10	2.0			CL			
16							
21							
7			Clay: some silt, few gravel, trace sand, grey (10YR5/1), low plasticity, firm, moist				Sample from 24 to 26 feet was obtained at 1340 hours. Headspace reading for the sample using a PID was 0.0 ppm.
10	2.0			CL			
12							
15							
4			Clay: some silt, few small gravel, trace sand, grey (10YR5/1), low plasticity, soft (upper foot) then firm, moist, silt content decreases after the first foot				Sample from 26 to 28 feet was obtained at 1355 hours. Headspace reading for the sample using a PID was 0.0 ppm.
5	2.0			CL			
6							
8							
6			Clay: some sand and silt, few gravel, grey (10YR5/1), low plasticity, soft, saturated				Sample from 28 to 30 feet was obtained at 1410 hours. Headspace reading for the sample using a PID was 0.0 ppm.
6	2.0		Clay: some silt, few gravel, trace sand, grey (10YR5/1), low plasticity, firm, moist				
6				CL			
9							
30							
12				CL			

Sand Pack

Fort Sheridan RI/FS

Log of Well LF2SB8/MW8d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30	5	2.0	Clay, some silty, stiff to medium gravel, grey (10YR5/1), low plasticity, firm, moist	CL			Sample from 30 to 32 feet was obtained at 1425 hours. Headspace reading for the sample using a PID was 0.0 ppm.
35							
40							
45							

Log of Well LF2SB8/MW8s

Fort Sheridan RI/FS

Contract Number CAAAIS-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 850 Track Mounted	Drilling Method: 6 3/4" HSA
Soil Sampling Device:	
Date Started: 7/23/91	Date Completed: 7/23/91
Total Depth Drilled: 9	
Water Level While Drilling (bgl): 5.5	Ground Elevation: 584.255

Completion Information

Water Level At Completion (bgl): 7.38	Date: 7/24/91
Screened Interval: 3.66-6.64	Filter Pack Interval: 3.75-9
Screen Length: 4.98	Bentonite Seal Interval: 1.4-3.75
End Cap Length: 0.36	Grout Interval: 0-1.4
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 6.5	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 537.477	Protective Casing Length/AG: 5.01/3.55

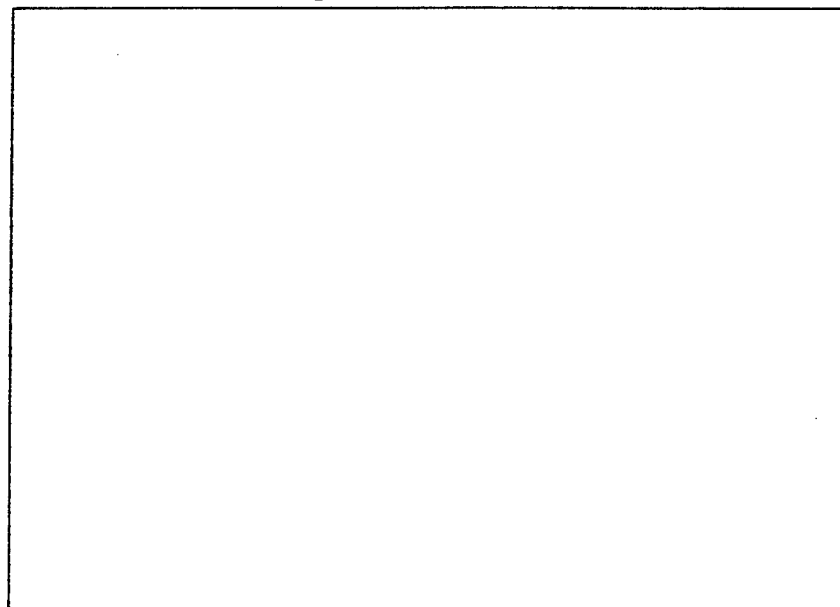
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/23/91	1755	1805	0	9

Abbreviations

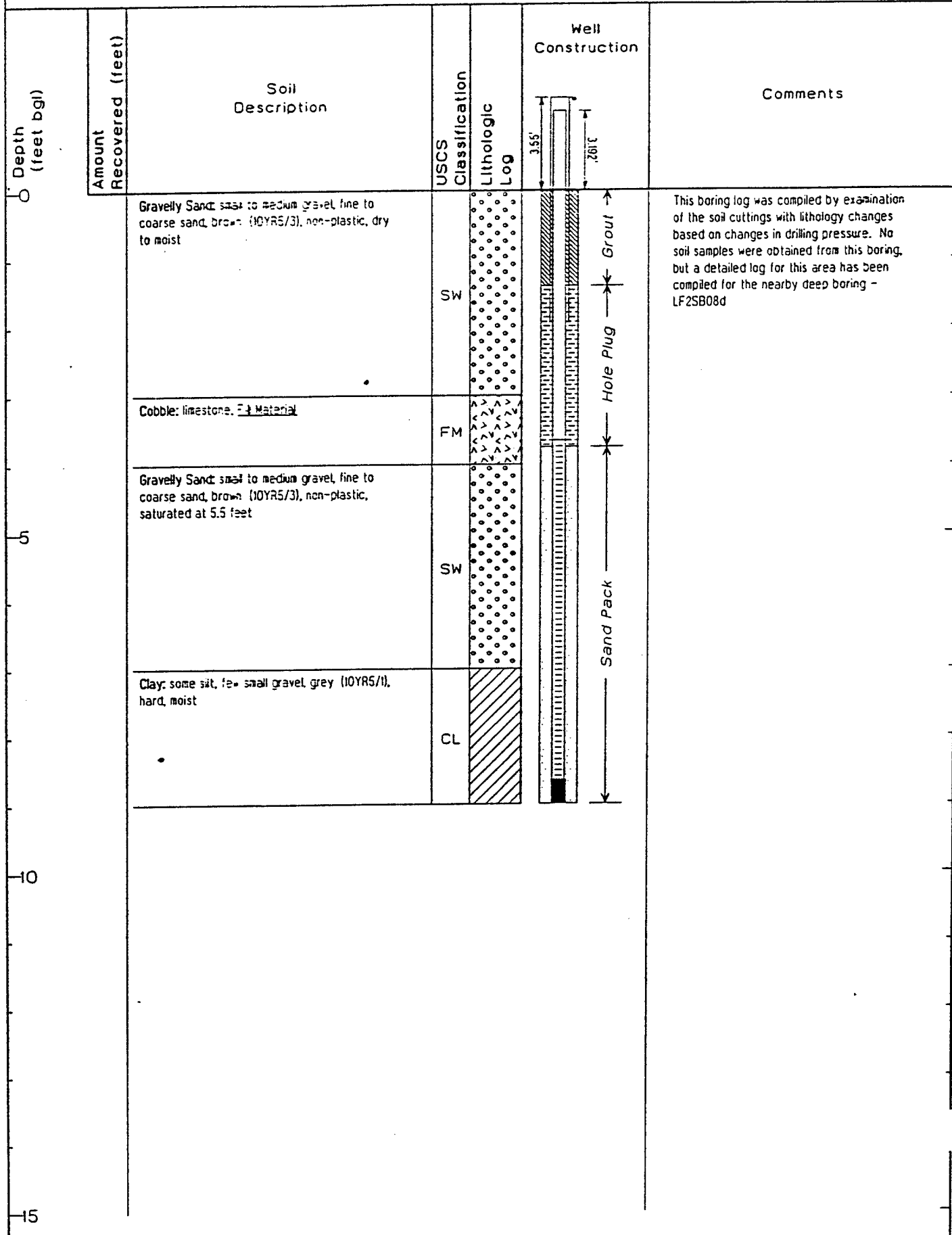
Location Sketch

Abbr.	Meaning
HSA	hollow stem auger
some	25-35%
few	5-10%
FM	fill material



Fort Sheridan RI/FS

Log of Well LF2SB8/MW8s



Log of Well LF2SB9/MW9d

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 850 Track Mounted	Drilling Method: 6 3/4" HSA
Soil Sampling Device: 3" x 2' Split Spoon	
Date Started: 7/24/91	Date Completed: 7/24/91
Total Depth Drilled: 32	
Water Level While Drilling (bgl): 4.0	
Ground Elevation: 582.4110	

Completion Information

Water Level At Completion (bgl): 12.5	Date: 7/24/91
Screened Interval: 19.74-29.74	Filter Pack Interval: 13.4-30.1
Screen Length: 10.0	Bentonite Seal Interval: 8.0-13.4
End Cap Length: 0.36	Grout Interval: 0-8.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 22.34	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 584.975	Protective Casing Length/AG: 5.02/3.1

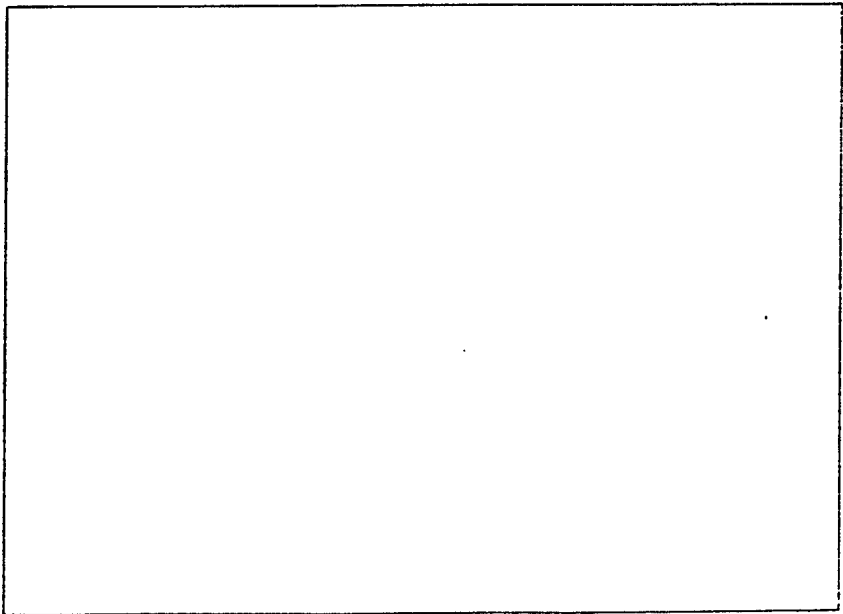
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/24/91	1043	1440	0	32

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	hollow stem augers
Some	>25-35%
little	>15-25%
few	>5-10%
trace	>5%
PID	photoionization detector
ppm	parts per million



Fort Sheridan RI/FS

Log of Well LF2SB9/MW9d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction		Comments
						1.3'	2.564'	
0			Sand: some small gravel, few fines, brown (10YR5/3), non-plastic, medium dense, moist, one inch gravel seam located at a depth of one foot, rounded, beach sand	SP				Sample from 0 to 2 feet was obtained at 1045 hours. Headspace reading of the sample using a PID was 0.0 ppm. Munsell color chart is referenced in the descriptions.
1		2.0						
3								
5			Sand: coarse grained, some small gravel, brown (10YR5/3), non-plastic, medium dense, rounded, moist	SP				
12								Sample from 2 to 4 feet was obtained at 1050 hours. Headspace reading of the sample using a PID was 0.0 ppm.
7			Sand: fine to medium grained, few gravel, trace fines, brown (10YR5/3), non-plastic, medium dense, rounded, moist	SP				
13		2.0						
15			Gravelly Sand: fine to coarse grained sand, small to medium gravel, trace fines, brown (10YR5/3), non-plastic, rounded, moist at 3.5 feet	SW				A cobble was encountered from 3.5 to 4 feet during drilling.
12								
11			Sand: some small to medium gravel, few fines, brown (10YR5/3), non-plastic, rounded, saturated	SP				Sample from 4 to 6 feet was obtained at 1100 hours. Headspace reading of the sample using a PID was 0.0 ppm.
10		1.6						
10								
12			Gravelly Sand: fine to coarse sand and gravel, wood fill, trace fines, brown (10YR5/3), non-plastic, rounded, saturated	SW				
3								Sample from 6 to 8 feet was obtained at 1110 hours. Headspace reading of the sample using a PID was 0.0 ppm.
3		1.6	Gravelly Sand: fine to coarse sand and gravel, wood fill, trace fines, brown (10YR5/3), non-plastic, rounded, saturated	SW				
5			Clay: some silt, few small gravel, grey (10YR5/1), low plasticity, hard, moist	CL				
10								
3			Clay: some silt, few small gravel, grey (10YR5/1), low plasticity, hard to firm, moist	CL				Sample from 8 to 10 feet was obtained at 1120 hours. Headspace reading of the sample using a PID was 0.0 ppm.
6		1.5						
9								
12			Clay: some silt, few small gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist	CL				Sample from 10 to 12 feet was obtained at 1135 hours. Headspace reading for the sample using a PID was 0.0 ppm.
2		2.0						
5								
9								
14			Clay: some silt, few small to medium gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist	CL				Sample from 12 to 14 feet was obtained at 1145 hours. Headspace reading for the sample using a PID was 0.0 ppm. Gravel was encountered at 12.5 feet.
4		2.0						
8								
10								
15			Clay: some silt, little small to medium gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist	CL				Sample from 14 to 16 feet was obtained at 1155 hours. Headspace reading for the sample using a PID was 0.0 ppm.
6		2.0						
5								

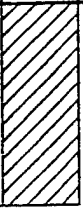
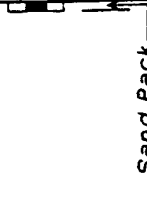
Fort Sheridan RI/FS

Log of Well LF2SB9/MW9d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15	8	2.0		CL			
11	4	2.0	Clay: some silt, few small to medium gravel, trace sand, grey (10YR5/1), low plasticity, hard, moist	CL			Sample from 16 to 18 feet was obtained at 1205 hours. Headspace reading for the sample using a PID was 0.0 ppm.
10	12	2.0		CL			
14	4	2.0	Clay: some silt, few medium gravel, grey (10YR5/1), low plasticity, hard, moist	CL			Sample from 18 to 20 feet was obtained at 1215 hours. Headspace reading for the sample using a PID was 0.0 ppm.
7	10	2.0		CL			
20	14	2.0	Clay: some silt, few small to medium gravel, grey (10YR5/1), low plasticity, hard, moist	CL			Sample from 20 to 22 feet was obtained at 1335 hours. Headspace reading for the sample using a PID was 0.0 ppm.
5	9	2.0		CL			
14	19	2.0	Clay: some silt, few small to medium gravel, grey (10YR5/1), low plasticity, firm to hard, moist	CL			Sample from 22 to 24 feet was obtained at 1345 hours. Headspace reading for the sample using a PID was 0.0 ppm.
3	9	2.0		CL			
17	4	2.0	Clay: some silt, few gravel, grey (10YR5/1), low plasticity, firm to hard, moist, gravelly from 24.4 to 24.6	CL			Sample from 24 to 26 feet was obtained at 1400 hours. Headspace reading for the sample using a PID was 0.0 ppm.
25	6	2.0		CL			
10	4	2.0	Clay: some silt, few medium gravel, grey (10YR5/1), low plasticity, firm to hard, moist	CL			Sample from 26 to 28 feet was obtained at 1415 hours. Headspace reading for the sample using a PID was 0.0 ppm.
7	10	2.0		CL			
3	5	2.0	Clay: some silt and small to medium gravel, grey (10YR5/1), low plasticity, firm to hard, moist	CL			Sample from 28 to 30 feet was obtained at 1420 hours. Headspace reading for the sample using a PID was 0.0 ppm.
9	11	2.0		CL			
30	13	2.0		CL			

Fort Sheridan RI/FS

Log of Well LF2SB9/MW9d

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30	5	2.0	Clay; some silt and small to medium gravel, grey (10YR5/1), low plasticity, firm, moist	CL			Sample from 30 to 32 feet was obtained at 1435 hours. Headspace reading for the sample using a PID was 0.0 ppm.
	12						
	16						
	21						
35							
40							
45							

Log of Well LF2SB9/MW9s

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 650 Track Mounted	Drilling Method: 6 3/4" HSA
Soil Sampling Device:	
Date Started: 7/24/91	Date Completed: 7/24/91
Total Depth Drilled: 9.2	
Water Level While Drilling (bgl): 4.0	Ground Elevation: 582.7102

Completion Information

Water Level At Completion (bgl): 3.0	Date: 7/25/91
Screened Interval: 3.53-8.84	Filter Pack Interval: 2.8-9.2
Screen Length: 4.93	Bentonite Seal Interval: 1.0-2.8
End Cap Length: 0.36	Grout Interval: 0-1.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 6.45	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 585.2959	Protective Casing Length/AG: 5.03/2.93

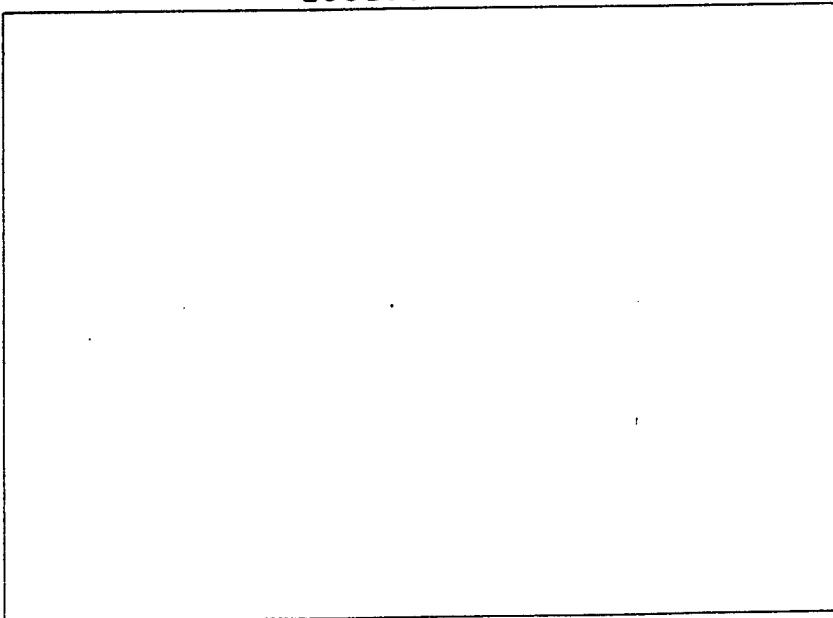
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/24/91	1700	1717	0	9.2

Abbreviations

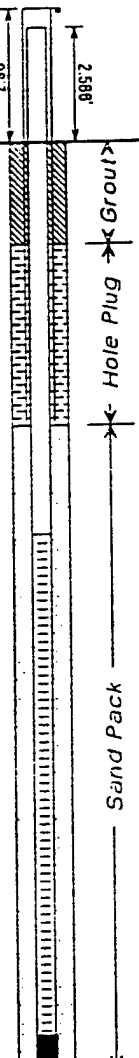
Location Sketch

Abbr.	Meaning
HSA	hollow stem auger
some	25-35%
few	5-10%
FM	fill material



Fort Sheridan RI/FS

Log of Well LF2SB9/MW9s

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Sand: some small to medium gravel, few fines (silt and clay), brown (10YR5/3), non-plastic, dry to moist	SP			This boring log was compiled by examination of the soil cuttings with lithology changes based on changes in drilling pressure. No soil samples were obtained from this boring, but a detailed log for this area has been compiled for the nearby deep boring - LF2SB09d
		Cobble: limestone, <u>FI Material</u>	FM			
5		Sand: some small to medium gravel, few fines (silt and clay), brown (10YR5/3), non-plastic, saturated	SP			
		Clay: some silt, few small gravel, grey (10YR5/1), low plasticity, moist	CL			
10						
15						

GEA 3

Log of Well LF3SBO1/MW01

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: Eric Bowman, ESE, Inc.	
Drilling Rig: CME-3	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2" Split Spoon	
Date Started: 02/04/91	Date Completed: 02/05/91
Total Depth Drilled: 22.0	
Water Level While Drilling (bgl): 14.5	Ground Elevation: 672.025

Completion Information

Water Level At Completion (bgl): 6.41	Date: 05/03/91
Screened Interval: 11.0-21.02	Filter Pack Interval: 6.0-22.0
Screen Length: 10.02	Bentonite Seal Interval: 3.0-6.0
End Cap Length: 0.5	Grout Interval: 0-3.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 14.2	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 675.180	Protective Casing Length/AG: 5.0/3.4

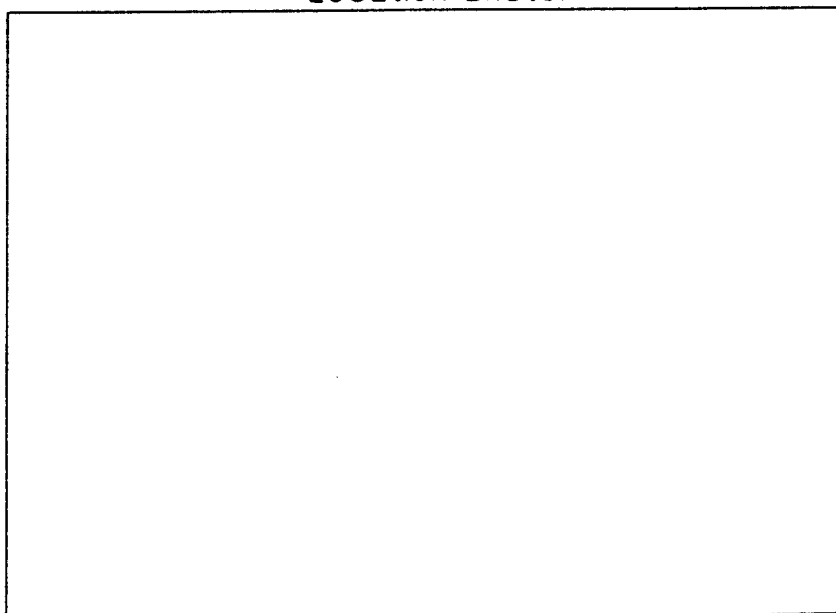
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
02/04/91	1225	1725	0	14
02/05/91	0845	1130	14	21

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Auger
trace	< 5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%
PID	Photoionization Detector
ppm	parts per million

Location Sketch



Fort Sheridan RI/FS

Log of Well LF3SB01/MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0						34"	
9			Sand; some clay, few silt and gravel, light yellowish brown (5YR6/3), medium dense, damp, subrounded, <u>Til</u> .	SC			1326 hours begin driving split-spoon. 0 to 3 inches - humic layer. Upper soils frozen. Headspace screening of the sample in the field using a PID was 0.0 ppm
10							
11							
17							
5			Sand; some clay, few silt and gravel, light yellowish brown (5YR6/3), medium dense, damp, subrounded, <u>Til</u> .	SC			Headspace screening of the sample in the field using a PID was 0.0 ppm
9	2.0		Clay; some silt, little sand and gravel, mottled gray-brown, low plasticity, firm, <u>Platy Till</u> .	CL			
13							
16			Clay; some silt, little sand and gravel, mottled gray-brown, low plasticity, firm, <u>Platy Till</u> .	CL			Gravel appears to be subangular limestone or dolomite. Headspace screening of the sample in the field using a PID was 0.0 ppm
7							
17	2.0			CL			
21							
30			Clay; some sand, little silt and gravel, mottled gray-brown, low plasticity, hard, slightly moist, <u>Till</u> .	CL			Encountering 2 to 3 inch dolomite cobbles as augers are penetrating. Bottom of sampling spoon has higher sand and moisture content. Headspace screening of the sample in the field using a PID was 0.0 ppm
11							
20	2.0			CL			
24							
25			Clay; trace sand and silt, mottled gray-brown, low plasticity, hard, platy, slightly moist, <u>Till</u> .	CL			Breathing air had a PID value of 0.0 ppm around auger cuttings at ground level while turning the augers. Soils seem drier. Headspace screening of the sample in the field using a PID was 0.0 ppm
91							
18	2.0			CL			
30							
45			Clay; trace sand and silt, brown (10YR5/3), low plasticity, hard, moist, <u>Platy Till</u> .	CL			Headspace screening of the sample in the field using a PID was 0.0 ppm. Breathing air had a PID value of 4.5 ppm near the ground when the augers penetrated this zone.
9							
25	2.0		Clay; trace sand and silt, gray (10YR5/1), medium plasticity, moist, <u>Til</u> .	CL			
24							
35			Clay; trace sand and gravel, gray (10YR5/1), medium plasticity, firm, moist, <u>Till</u> .	CL			Headspace screening of the sample in the field using a PID was 0.0 ppm. Augers advance slows as the clay becomes tighter.
9							
14	2.0			CL			
17							
16							
6			Clay; trace gravel, gray (10YR5/1), medium plasticity, moist, moist, homogeneous, <u>Till</u> .	CL			February 5, 1991 Observed 18 inches of water collect overnight.
15							

B - 105

Log of Well LF3SBO2/MW02

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: Eric Bowman, ESE, Inc.	
Drilling Rig: CME-3	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2" Split Spoon	
Date Started: 02/10/91	Date Completed: 02/11/91
Total Depth Drilled: 36.42	
Water Level While Drilling (bgl): 26.2	Ground Elevation: 668.03

Completion Information

Water Level At Completion (bgl):	Date: 02/11/91
Screened Interval: 26.34-36.00	Filter Pack Interval: 19-36.42
Screen Length: 9.99	Bentonite Seal Interval: 14-19
End Cap Length: 0.15	Grout Interval: 0-14
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 25.66	Protective Casing Type: flush mount
Top of Casing Elevation: 667.48	Protective Casing Length/AG: 1/0

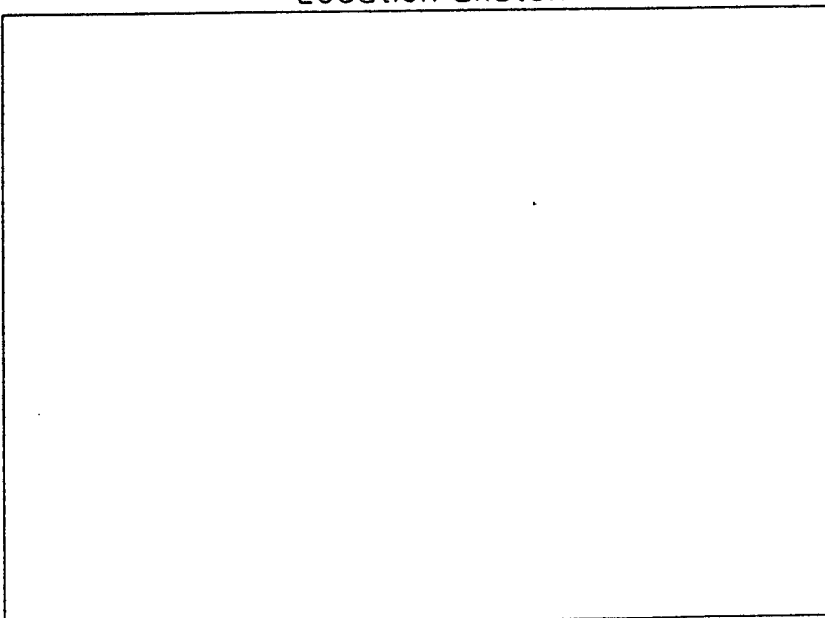
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
02/10/91	0900	1700	0	30
02/11/91	0900	1700	30	36

Abbreviations

Abbr.	Meaning
NL	Not Logged
med	medium
SS	Soil Sample
BSL	Below Surface Level
apx	approximately
PID	Photoionization Detector
HSA	Hollow Stem Auger
REC	recovery
BHP	Bentonite Hole Plug
ppm	part per million
trace	< 5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch



Fort Sheridan RI/FS

Log of Well LF3SB02/MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0				NL			0 - 0.2': asphalt 0.2 - 0.8': pavement gravel base 1" and fine limestone gravel 0.8 - 2': brown
4		1.2	Clay: little sand and silt, few gravel, mottled, grey-green-brown coloration, low plasticity, hard, slightly moist, <u>Platy Till</u> .	CL			REC: 60%
10							
12			Clay: few sand and silt, trace of subangular gravel, mottled grey-green-brown, low plasticity, hard, slightly moist (but moister than ss-I), <u>Platy Till</u> .	CL			REC: 100% PID: 0 ppm 200 89%
6		2.0					
8							
12							
17			Clay: 6-6.8': same as above but moister. 6.8-8.0': some silt, little fine sand, few gravel, low plasticity, mottled grey-brown, very hard, low moisture to dry, <u>Platy Till</u> .	CL			6 - 6.8': very moist 6.8 - 8': very dry REC: 100% PID: 0 ppm
6		2.0					
20							
25							
35			Clay: some silt, few gravel, trace sand, yellowish brown (IOYR 5/4), very hard, low moisture, <u>Platy Till</u> .	CL			moisture appears on augers and outside of SS, but material is dry, possible small wet cone or condensation from heat build-up on augers. REC: 100% PID: 0 ppm
11		2.0					
20							
32							
34			Clay: some silt, few gravel and sand, yellowish brown (IOYR 5/4), low plasticity, very hard, moist, <u>Platy Till</u> .	CL			moisture content increasing, visible water behind gravel pieces, gravel is subangular to rounded, soil is slightly mottled with limonite discoloration. REC: 100%
11		2.0					
20							
32							
36			Clay: some silt, few gravel, trace sand, brown (IOYR 5/1), low plasticity, very hard, moist, <u>Platy-Blocky Till</u> .	CL			still observing wet N rod and SS drilling is very slow. REC: 100% PID: 0 ppm
16		2.0					
25							
43							
45							
24		1.0	Clay: some silt, little gravel, trace sand, slightly mottled, grey (IOYR 5/1), low plasticity, very hard, moist, <u>Till</u> .	CL			rock lodged in front of half of SS caused poor recovery but recovered sample was representative of interval. REC: 50% PID: 0 ppm
33							

Fort Sheridan RI/FS

Log of Well LF3SB02/MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
46	1.0			CL			
46							
6			Clay; little silt, fs = gravel, grey (10YR 5/1), low plasticity, hard, moist, <u>Till</u>				very moist at tip of SS. mottling is gone. possible top of oxidation zone. REC: 100% PID: 0 ppm
12	2.0			CL			
18							
20							
5			Clay; little silt, fs = gravel, trace sand, grey (10YR 5/1), low plasticity, hard, moist, <u>Till</u>				interval had a small fine-grained, very moist, well-rounded sand string at apx. 19' BSL. moisture is about the same as above. REC: 100% PID: 0 ppm
13	2.0			CL			
19							
20							
23							
8			Clay; little silt, fs = to trace gravel and sand, grey (10YR 5/1), low to med plasticity, hard, moist, <u>Till</u>				moisture is about the same, no sand stringers. REC: 100% PID: 0 ppm
17	2.0			CL			
21							
22							
12			Clay; little silt, trace gravel, grey (10YR 5/1), low plasticity, hard, moist, <u>Till</u>				gravel content decreased to almost nothing. moisture about the same; only slightly moist. REC: 100% PID: 0 ppm
16	2.0			CL			
20							
20							
6			Clay; little silt, trace gravel, grey (10YR 5/1), med plasticity, hard, moist, <u>Till</u>				moisture is slightly more than previous sample. REC: 100% PID: 0 ppm
14	2.0			CL			
18							
22							
11			Clay; little silt, trace gravel, grey (10YR 5/1), med plasticity, hard, moist, <u>Till</u>				cutting becoming very moist through 24 - 26' zone. REC: 100% PID: 0 ppm
14	2.0			CL			
19							
19							
7			Clay; little silt, trace gravel, grey (10YR 5/1), med plasticity, hard, moist, <u>Till</u>				gravel content increased a little. moisture content is about the same for the last 4' end 2/10/91. REC: 100%
14	2.0			CL			
19							
30							
24				CL			

Fort Sheridan RI/FS

Log of Well LF3SB02/MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30	4		Clay: little silt, trace gravel, grey (10YR 5/1), med plasticity, hard, moist, <u>Till</u> .	CL			start 2/11/91 prior to drilling, 0.96' of water in hole. static water level at 27.70'. clay is a little more moist than SS-14. REC: 100% PID: 0 ppm
13	2.0						
21							
25			Clay: little silt, trace gravel, grey (10YR 5/1), med to slightly high plasticity, hard, moist, <u>Till</u> .	CL			moisture slightly greater than SS-14, clay becoming more plastic. auger cutting at this interval very wet. REC: 100% PID: 0 ppm
7							
12	2.0						
18							
22			Clay: little silt, trace gravel, grey (10YR 5/1), med to slightly high plasticity, hard, moist, <u>Till</u> .	CL			little difference distinguishable from last sample. REC: 100% PID: 0 ppm
7							
13	2.0			CL			
17							
20							
35							
40							
45							

Log of Well LFO3SB03/LF3MWO3

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Driller & Company: Don Maki, Pete Buell, ESE, Inc.		
Geologist/Logger & Company: Andrew Granskog, ESE, Inc.		
Drilling Rig: CME 55 Truck Mounted Rig		Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2' Split Spoon		
Date Started: 1/27/91	Date Completed: 1/29/91	Total Depth Drilled: 36.26
Water Level While Drilling (bgl): 29		Ground Elevation: 660.429

Completion Information

Water Level At Completion (bgl): 30.24	Date: 1/30/91
Screened Interval: 26.08-36.11	Filter Pack Interval: 21.10-36.26
Screen Length: 10.03	Bentonite Seal Interval: 15.8-21.10
End Cap Length: .15	Grout Interval: 0-15.8
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 28.60	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 663.358	Protective Casing Length/AG: 5/3.1

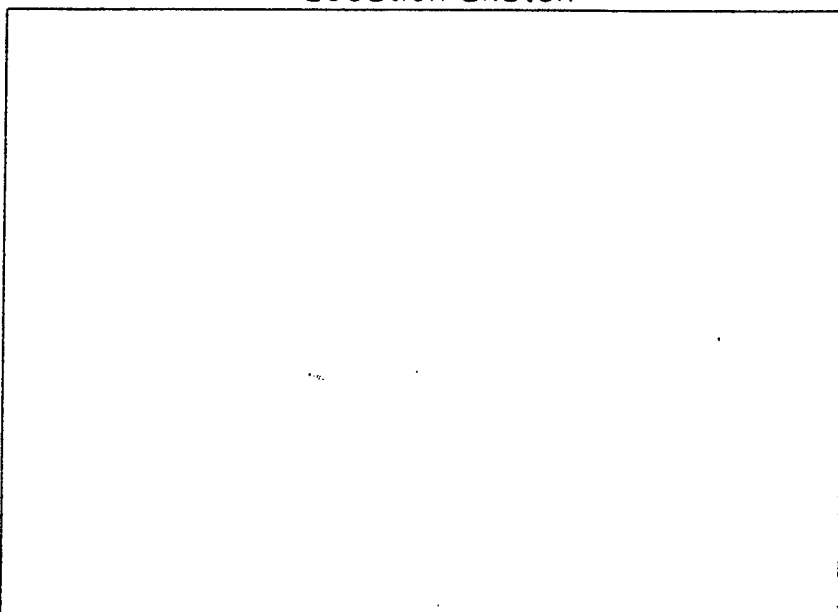
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/27/91	0930	1430	0	20
1/28/91	1415	1700	20	34
1/29/91	0833	----	34	36

Abbreviations

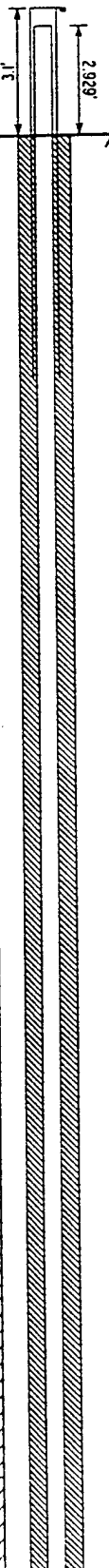
Location Sketch

Abbr.	Meaning
HSA	hollow stem auger
trace =	< 5%
few =	5-10%
little =	15-25%
some =	30-45%
mostly =	50-100%
SS	split spoon



Fort Sheridan RI/FS


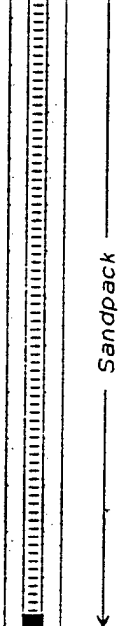


Log of Well LF03SB03/LF3MW03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Topsoil, frozen, some gravel, clay, dark brown.	NL			
5		1.0	Clay: some sand and fine to medium gravel, very dark grey (10YR3/1) changing to dark yellowish brown at 2.5 ft. (10YR4/3) with mottles (10YR5/8) yellowish brown, low plasticity, hard, moist, no apparent bedding, angular to subangular grains <u>Glacial Till</u> with surficial disturbance	CL			Collected SS1 at 1-3' below ground level. Munsell color chart is referenced in the descriptions.
8				NL			
7		1.4	Clay: little sand and fine to medium gravel, yellowish brown (10YR5/4), low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS2 at 4-6' below ground level.
9							
10							
14		2.0	Clay: few silt and fine gravel, yellowish brown (10YR5/4), changing to light yellowish brown (2.5Y6/2) at 7 feet, little silt with mottles grey (10YR5/1), low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS3 at 6-8' below ground level.
17							
23		2.0	Clay: trace silt and fine to medium gravel, dark greyish brown (10YR4/2) with little olive grey (5Y6/2), low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS4.
27		2.0	Clay: trace fine gravel and silt, brown (10YR4/3), with deposits of black (10YR2/1) material and mottles grey (10YR5/1), low plasticity, hard, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS5.
28							
50		2.0	Clay: trace fine gravel, brown (10YR5/3), with striations (vertical) in fractures strong brown (10YR4/6) with black (7.5YR2/0) intercalations of magnetite, low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS6.
16							
35		2.0	Clay: trace fine gravel, yellowish brown (10YR5/4) to dark grey (10YR4/1) at 14.5' below ground level, low plasticity, hard, moist, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS7.
43							
50							
8		2.0					
18							

Fort Sheridan RI/FS				Log of Well LF03SB03/LF3MW03			
Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
26	2.0			CL			
35							
8			Clay: trace fine gravel, dark grey (10YR4/1), low plasticity, hard, moist, no apparent bedding. <u>Glacial Till</u>				Collected SS8.
16	2.0			CL			
21							
25							
6			Clay: trace fine gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Glacial Till</u>				Collected SS9. Some water between sample and spoon but sample is only moist after scraping.
10	2.0			CL			
16							
19							
7			Clay: trace fine gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Glacial Till</u>				Collected SS10.
10	2.0			CL			
15							
22							
17			Clay: trace fine gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Glacial Till</u>				Spoon hole is staying open, collected SS11 from 22-24' without drilling down.
22	2.0			CL			
26							
34							
26			Clay: trace fine gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Glacial Till</u>				Collected SS12. Spoon hole stayed open. Checked with Drop tape, drilled to 26' below ground level.
30	2.0			CL			
40							
50							
10			Clay: trace fine gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Glacial Till</u>				Drilled to 26' and collected SS13.
19	2.0			CL			
28							
35							
33			Clay: trace fine gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding. <u>Glacial Till</u>				Spoon hole stayed open. Sampled SS14 and drilled to 30' below ground level.
49	2.0			CL			
60							
75							

Fort Sheridan RI/FS

Log of Well LF03SB03/LF3MW03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30							
6			Clay; trace fine gravel, dark grey (10YR4/1), low plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u> . 30-30.3 has some fine sand, soft, saturated.	CL			Auger at 30' below ground level. Confined conditions, 1 ft. of water in auger. Drilled to 32', static water level in auger immediately after drilling 31.8' below ground level. Collected SS15.
9	2.0						
18							
22			Clay; trace fine gravel with thin layer of fine sand 0.1 ft. thick or less at 33.5 ft' below ground level, dark grey (10YR4/1), low plasticity, firm, no apparent bedding, <u>Glacial Till</u> .	CL			Collected SS16 after drilling to 32' below ground level.
6							
10	2.0						
16			Clay; trace fine gravel, dark grey (10YR4/1), low plasticity, firm, no apparent bedding, <u>Glacial Till</u> . Harder consistency at 34.5 to 36' below grade.	CL			Collected SS17. Set well from 26 to 36' below ground level.
21							
8							
12	2.0						
16							
23							
			Note: Casing lengths: 3.61' 4.99' 5.02' 5.00' 5.00' 5.00' endcap=.15 ft. screen length 10.15' including endcap		1/26/91 Static water level in augers prior to drilling to 35' below ground level is 31.2 ft. Screened interval from 26.08-36.11' below ground level. Grout to surface. Stickup 2.52'		
35							
40							
45							

Log of Well LF3SB4/MW4d

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Pete Buell, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey sampler

Date Started: 2/04/91 Date Completed: 2/05/91

Total Depth Drilled: 70

Water Level While Drilling (bgl): 68.8

Ground Elevation: 653.061

Completion Information

Water Level At Completion (bgl): 49.06	Date: 2/06/91
Screened Interval: 60.02-70.01	Filter Pack Interval: 56.34-70.16
Screen Length: 9.99	Bentonite Seal Interval: 50.40-56.34
End Cap Length: 0.5	Grout Interval: 0-50.40
Screen Type/Dia.: 40 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 62.4	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 655.944	Protective Casing Length/AG: 5.02/3.0

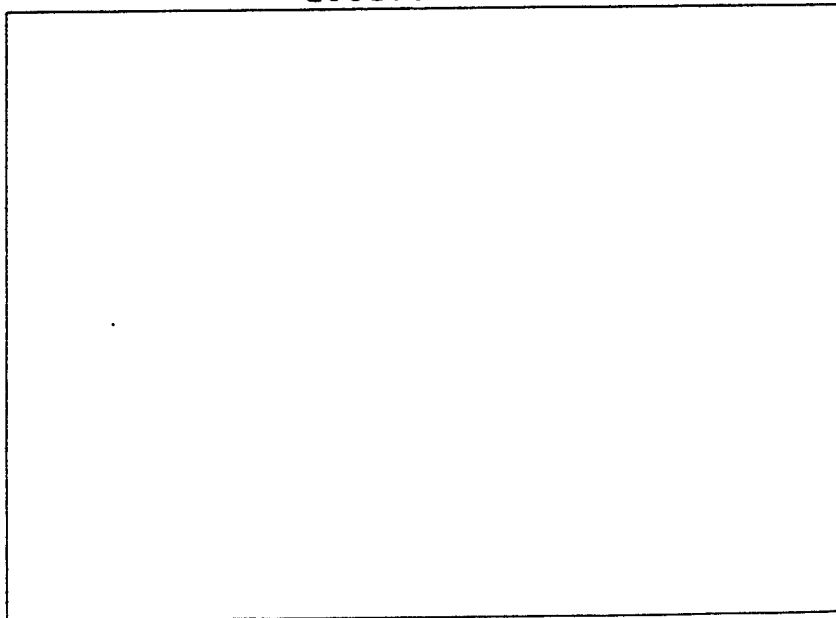
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
2/04/91	1410	1700	0	59
2/05/91	0755	1020	59	70
2/05/91	1210	1250	0	70

Abbreviations

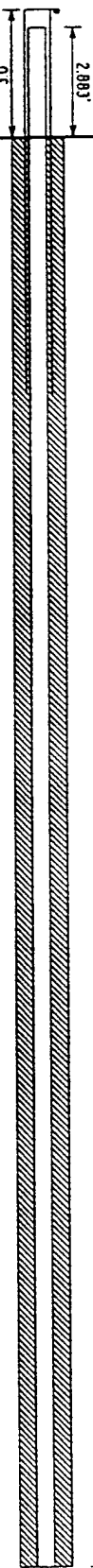
Abbr.	Meaning
NL	not logged
HSA	hollow stem auger

Location Sketch



Fort Sheridan RI/FS

Log of Well LF3SB4/MW4d

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Sandy Clay: 30% sand, 5% gravel, black (7.5YR2/1), hard, moist (frozen), <u>Topsoil</u>	CL			Sample from 0 to 4 feet was obtained at 1057 hours. Roots were present throughout the sample. Frost zone was approximately one foot thick.
3.6		Silty Clay: 25% silt, <5% gravel, light brown (7.5YR8/4), and grey (10YR5/1), hard, dry, iron staining present	CL			
4.97		Silty Clay: 20% silt, 0% sand to medium gravel, light brown (7.5YR2/4) and grey (10YR5/1), low plasticity, hard, dry, iron staining present	CL			Sample from 4 to 9 feet was obtained at 1125 hours. Various debris (including cobbles) were encountered from 4 to 7 feet.
10		Clay: 15% silt, 5% sand gravel, brown (10YR5/3) some areas have grey (10YR5/1), low plasticity, hard, dry	CL			Sample from 9 to 14 feet was obtained at 1140 hours. Rocks, cobbles, and concrete were encountered while drilling from 10 to 13 feet.
15		Clay: 15% silt, 5% sand gravel, grey (10YR5/1), low plasticity, hard, dry	CL			Sample from 14 to 19 feet was obtained at 1155 hours.
	5.0	Clay: 10% silt, 10% sand to medium gravel, grey (10YR5/1), low plasticity, hard, moist	CL			

Fort Sheridan RI/FS

Log of Well LF3SB4/MW4d

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15	5.0		CL			
20	5.0	Clay: 15% silt, 10% small to medium gravel, grey (10YR5/1), low plasticity, hard, moist	CL			Sample from 19 to 24 feet was obtained at 1317 hours.
25	5.0	Clay: 10% silt, 5% gravel, <5% sand, grey (10YR5/1), low plasticity, hard, moist, small zone from 28 to 29.3 feet which contains more silt	CL			Sample from 24 to 29 feet was obtained at 1339 hours.
30	5.0	Clay: 15% silt, 10% small to large gravel, grey (10YR5/1), low plasticity, hard, slightly moist, small cobble from 33.25 to 33.6 feet	CL			Sample from 29 to 34 feet was obtained at 1355 hours.

Fort Sheridan RI/FS

Log of Well LF3SB4/MW4d

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30	5.0		CL			
35	5.0	Clay: 20% silt, 5% sand, 5% gravel, grey (10YR5/1), medium plasticity, hard, moist, softer at 38 to 39 feet	CL			Sample from 34 to 39 feet was obtained at 1440 hours.
40	5.0	Clay: 25% silt, 5% gravel, grey (10YR5/1), low plasticity, hard, slightly moist, large gravel encountered at 39 to 39.25 feet and 39.7 to 40 feet	CL			Sample from 39 to 44 feet was obtained at 1500 hours.
45	5.0	Clay: 30% silt, 5% sand, 5% gravel, dark grey (10YR4/1), low plasticity, hard, vertical jointing filled with fine sand present from 45.2 to 45.8 feet	CL			Sample from 44 to 49 feet was obtained at 1540 hours.

Cement Grout

Fort Sheridan RI/FS

Log of Well LF3SB4/MW4d

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
45						2100 92%
	5.0		CL		Cement Grout	
50		Silty Clay: 35% silt, 5% small to medium gravel, dark grey (10YR4/1), low plasticity, hard, slightly moist	CL			Sample from 49 to 54 feet was obtained at 1640 hours.
	5.0		CL		Bentonite Hole Plug	
55		Silty Clay: 30% silt, 10% sand, <5% gravel, grey (10YR5/1), low plasticity, hard slightly moist, sand filled vertical joints present throughout	CL			Sample from 54 to 59 feet was obtained at 1655 hours. Drilling was stopped for the day after reaching a depth of 59 feet.
	5.0		CL		Sand Pack	
60		Clay: 25% silt, 5% gravel, grey (10YR5/1), medium plasticity, hard, (softer from 62.5 to 64 feet), moist	CL			Drilling continued on February 5, 1991. Sample from 59 to 64 feet was obtained at 1335 hours.

Fort Sheridan RI/FS

Log of Well LF3SB4/MW4d

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
60						Drilling was easier at 60 feet.
5.0			CL			Cobbles were encountered during drilling at 63 feet.
65		Clay: 25% silt, 5% gravel, grey (10YR5/1), low plasticity, hard, moist	CL			Sample from 64 to 69 feet was obtained at 1015 hours.
5.0			CL			
70		Sand: 10% clay, 5% silt, dark grey (10YR4/1), non-plastic, subrounded, saturated Interval 69 to 70.16 feet was not sampled or logged	SC NL			Saturated sand was encountered at 68.8 feet. No samples were obtained from 69 to 70 feet.
75						Forty gallons of water was added to the bore hole during installation of the monitoring well.

Log of Well LF3SB5/MW5

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6

Soil Sampling Device: Laskey sampler

Date Started: 1/26/91 Date Completed: 1/27/91

Total Depth Drilled: 61

Water Level While Drilling (bgl): 54

Ground Elevation: 653.025

Completion Information

Water Level At Completion (bgl):	Date:
Screened Interval: 51 to 61	Filter Pack Interval: 45 to 61
Screen Length: 10.03	Bentonite Seal Interval: 40 to 45
End Cap Length: 0.15	Grout Interval: 0 to 40
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 50.67	Protective Casing Type: flush mount
Top of Casing Elevation: 652.820	Protective Casing Length/AG: 1/0

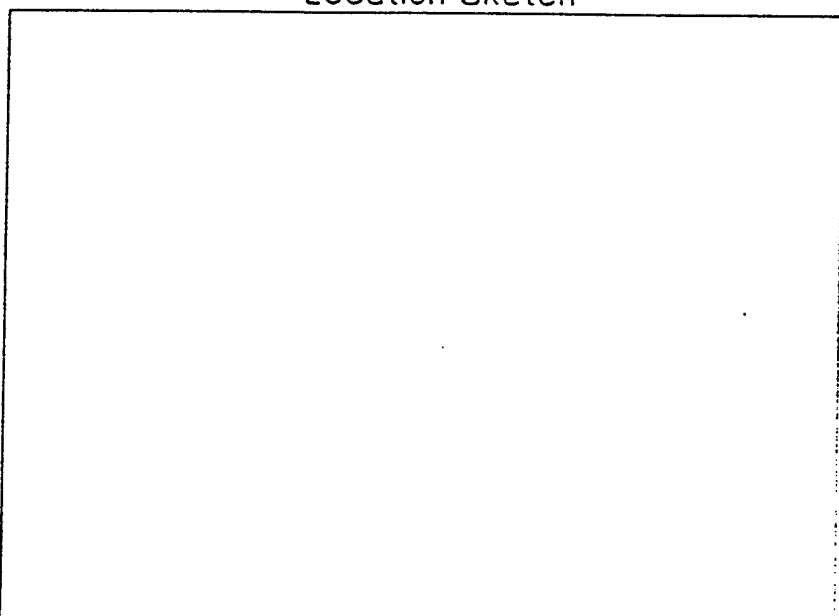
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/26/91	0851	1828	0	44
1/27/91	0930	1915	44	61

Abbreviations

Location Sketch

Abbr.	Meaning
PID	Photoionization Detector
HSA	hollow stem auger
NAB	Not Above Background
PPM	Parts Per Million



Fort Sheridan RI/FS

Log of Well LF3SB5/MW5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0	0.0	Blacktop: Blacktop and cement, <u>Blacktop</u>				Top of casing is 0.24 feet below grade.
1.5		Fill Material Cinders, broken brick and nails, <u>Fill Material</u>	FM			Sample from 1 to 4 feet was obtained at 0958 hours. Weather conditions: West wind at 15-20 mph; partly cloudy with cirrus, very cold. PID reading of breathing zone is 0.0 ppm. PID reading of sample is 0.0 ppm.
5		Fill Material Cinders, broken brick and nails, <u>Fill Material</u>	FM			Sample from 4 to 9 feet was obtained at 1011 hours. Clay is mottled with gray (10YR5/1) patches beginning at 7.5 feet. PID reading of sample is 0.0 ppm.
3.75		Silty Clay with Gravel 5-10% silt, <1% gravel, brown (10YR5/3), medium plasticity, hard, dry to slightly moist, no apparent bedding, gravel subrounded to subangular, <u>Glacial Till</u>	CL			
10		Silty Clay with Gravel 5-10% silt, <1% gravel, brown (10YR5/3), medium plasticity, hard, moist, no apparent bedding, gravel rounded to subangular, <u>Glacial Till</u>	CL			Sample from 9 to 14 feet was obtained at 1025 hours. PID reading of sample is 0.0 ppm.
4.0						
15	5.0	Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, moist, no apparent bedding, gravel sub- rounded to sub angular, <u>Glacial Till</u>	CL			Sample from 14 to 19 feet was obtained at 1041 hours. PID reading of sample is 0.0 ppm.


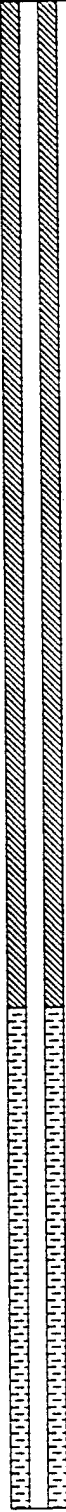



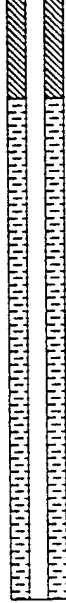

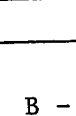

Fort Sheridan RI/FS

Log of Well LF3SB5/MW5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
	5.0		CL			
20		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, moist, no apparent bedding, gravel sub- rounded to subangular, <u>Glacial Till</u>	CL			Sample from 19 to 24 feet was obtained at 1107 hours. PID reading of sample is 0.0 ppm.
	5.0		CL			
25		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, moist, no apparent bedding, gravel sub- rounded to subangular, <u>Glacial Till</u>	CL			Sample from 24 to 29 feet was obtained at 1151 hours. PID reading of sample is 0.0 ppm.
	5.0		CL			
30		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, moist, no apparent bedding, gravel sub- rounded to subangular, <u>Glacial Till</u>	CL			Sample from 29 to 32.5 feet was obtained at 1230 hours. Auger re- fused was encountered at 32.5 feet. Borehole is cement grouted to surface and redrilled in adjacent location. Stratigraphy from first boring is accepted as representative of the second. Logging of samples continues
	2.5		CL			

Fort Sheridan RI/FS

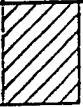
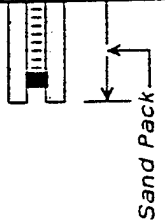
Log of Well LF3SB5/MW5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30			CL		 Cement Grout	
2.5		Not Logged	NL			Attempt to collect first sample in second borehole from 29 to 34 feet is unsuccessful due to failure of knockout plug to shatter when NW rod is allowed to freefall on top of it. This prevented sample material to enter Laskey Sampler.
35			NL			Laskey Sampler is again empty after further attempts to destroy knock-out plug at bottom of borehole. Retrieve plug fragments with 3-inch split-spoon.
5.0			NL		 Bentonite Hole Plug	
40	1.0	Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, moist, no apparent bedding, gravel sub-rounded to subangular, Glacial Till	CL			2-foot interval tested with Laskey Sampler to determine if borehole is clear of knockout plug fragments. If so, then 5-foot sampling intervals will resume. Sample from 39 to 41 feet was obtained at 1742 hours. PID reading of sample is 0.0 ppm.
		Not Logged	NL			Large piece of knockout plug in sampler nose prevents recovery of sample.
0.0			NL			
5.0		Silty Clay with Gravel 5-10% silt, <1% gravel, gray (10YR5/1), medium plasticity, hard, moist, no apparent bedding, gravel sub-rounded to subangular, Glacial Till	CL			Sample from 44 to 49 feet was obtained at 1016 hours (1/27/91). PID reading of sample is 0.0 ppm.
45						

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Fort Sheridan RI/FS

Log of Well LF3SB5/MW5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
60	2.0		CL			
65						
70						
75						

Log of Test Pit VES1TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/23/91

Date Completed: 02/26/91

Total Depth of Trench: 14.5

Ground Elevation: 678.850

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/26/91	0815	1200	0	14.8


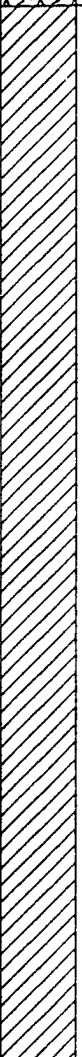
Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
BGL	Below Grade Level
w/	with

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES1TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Fill Material: blacktop, rip rap and fill materials.	TM		
	Silty Clay and Gravel: 5 to 10% sil, 2 to 5% gravel, light yellowish brown (10YR 6/4) mottled with gray (10YR 5/1), low plasticity, firm to hard, moist, homogeneous, gravel is subrounded to angular, <u>Glacial Till</u> .	CL		sampled at 2.5 feet BGL and 7.0 feet BGL
	Silty Clay and Gravel: 5 to 10% sil, 2 to 5% gravel, gray (10YR 5/1), med plasticity, hard, moist, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		sampled at 14.8 feet BGL
15				

Log of Test Pit VES1TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Backhoe Operator & Company: Bob Bowman, ESE, Inc.	
Backhoe: Case 580K	
Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts	
Date Started: 02/25/91	Date Completed: 02/25/91
Total Depth of Trench: 14.5	Ground Elevation: 677.273
Water Level While Trenching (bgl):	

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/25/91	1018	1315	0	14.5





Abbreviations

Abbr.	Meaning
w/	with
med	medium
BGL	Below Grade Level

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES1TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic Log	Comments
		Classification		
0	<p>Fill Material: blacktop, 0 to 0.2 feet.</p> <p>loose gravel fill, 0.2 to 0.7 feet.</p> <p>dark fill material containing cinders and brick, 0.7 to 0.9 feet.</p>	FM		
	<p>Silty Clay with Gravel 5 to 10% silt, <1% gravel, light olive brown (10YR 5/3), low plasticity, hard, moist, homogeneous, gravel is rounded to subangular, <u>Glacial Till</u>.</p>	CL		samples taken at 2.5 and 7.0 feet BGL
5	<p>Silty Clay with Gravel 5 to 10% silt, <1% gravel, brown, (10YR 5/3), mottled with light gray (10YR 7/1), low plasticity, hard, moist, homogeneous, gravel subrounded to subangular, <u>Glacial Till</u>.</p>	CL		
10				
	<p>Silty Clay with Gravel 5 to 10% silt, <1% gravel, gray (10YR 5/1), med plasticity, hard, moist, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u>.</p>	CL		samples taken at 14.5 feet BGL
15				

Log of Test Pit VES1TP3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/26/91

Date Completed: 02/26/91

Total Depth of Trench: 14.5

Ground Elevation: 679.225

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/26/91	1400	1630	0	14.5




Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
med	medium
BGL	Below Grade Level
w/	with

Fort Sheridan RI/FS

Log of Test Pit VES1TP3

Depth (feet bgl)	Soil Description	USCS	Lithologic Log	Comments
		Classification		
0	Fill Material: fill and blacktop.	FM		
5	Silty Clay and Gravel: 5 to 10% silt, 2 to 5% gravel, yellowish brown (10YR 5/4), mottled with gray (10YR 5/1), low plasticity, hard moist, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		samples collected at 2.5 feet BGL
10	Silty Clay and Gravel: 5 to 10% silt, 2 to 5% gravel, gray (10YR 5/1), med plasticity, hard, moist, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		samples collected at 8.0 and 14.5 feet BGL
15				

Log of Test Pit VES2TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/22/91

Date Completed: 02/22/91

Total Depth of Trench: 14.5

Ground Elevation: 674.206

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching	
	Start	End	Start	Per Shift End
02/22/91	1340	1530	0	14.5


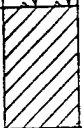


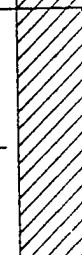
Abbreviations

Abbr.	Meaning
approx	approximately
med	medium
w/	with

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES2TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Fill Material: wood, cinders, glass, various metallic contrivances.	FM		
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, brown (10YR 5/3), mottled with light gray (10YR 7/1) and white (10YR 8/1), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, yellowish brown (10YR 5/4), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		white/gray mottling terminates gradually to 5 feet.
5				
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, yellowish brown (10YR 5/4), med plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
10				
	Silty Clay with Gravel: 5 to 10% silt, approx. 1% gravel, gray (10YR 5/1), med plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
15				

Log of Test Pit VES2TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/22/91

Date Completed: 02/22/91

Total Depth of Trench: 14.0

Ground Elevation: 674.962

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/22/91	0920	1125	0	14.0

Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
w/	with

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES2TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Fill Material and loose Gravel - sand and slag/cinders.	FM		
	Silty Clay and Gravel: 5 to 10% silt, <1% gravel, brown (10YR 5/3), mottled with light gray (10YR 7/1) and white (10YR 8/1), low plasticity, hard, moist, massive, homogeneous, gravel is subrounded to angular, <u>Glacial Till</u> .	CL		light gray/white zones are vertical, possibly fracture fillings
5	Silty Clay and Gravel: 5 to 10% silt, <1% gravel, yellowish brown (10YR 5/4), low plasticity, hard, moist, massive, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		vertical gray/white zones terminate at 5 feet
10				
	Silty Clay and Gravel: 5 to 10% silt, <1% gravel, gray (10YR 5/1), med plasticity, hard, moist, massive, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		transition from brown to gray clay occurs at 12 feet
15				

Log of Test Pit CSA3TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/08/91

Date Completed: 02/08/91

Total Depth of Trench: 2.0

Ground Elevation: 661.711

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching	
	Start	End	Start	End
02/08/91			0	2.0




Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit CSA3TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Clay: some sand and fine gravel, very dark gray (10YR 3/1), low plasticity, soft, moist, <u>Fill Material</u> .	CL		collected sample at 2.0 feet (just above concrete)
	Clay: some sand and fine to coarse gravel, brown (10YR 5/3), with mottles red (2.5YR 5/8) and black (2.5Y 2/0), some cobble sized chunks of asphalt, low plasticity, firm, moist, <u>Fill Material</u> .	CL		
	Concrete: thickness of concrete is unknown.	CN		
5				
10				
15				

Log of Test Pit CSA3TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.	
Backhoe Operator & Company: Bob Bowman, ESE, Inc.	
Backhoe: Case 580K	
Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts	
Date Started: 02/08/91	Date Completed: 02/08/91
Total Depth of Trench: 14.5	Ground Elevation: 660.739
Water Level While Trenching (bgl): 14.5	

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/08/91	1021	1411	0	14.5










Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit CSA3TP2

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Sand and Gravel: some clay, some coal, black (10YR 2/1), med dense, nonplastic, moist, <u>Fill Material</u> .	GP		
	Sand and Gravel: little coal, brown (10YR 4/3), nonplastic, med dense, moist, <u>Fill Material</u> .	GP		
	Coat: sand and fine to coarse gravel, black (2.5Y 2/0).	FM		
	Clay: trace sand and fine gravel, yellowish brown (10YR 5/4), with areas of dk grayish brown (2.5Y 4/2) and black (2.5Y 2/0), low plasticity, firm, moist, <u>Glacial Till</u> .	CL		
	Clay: trace sand, dark gray (5Y 4/1), some black (2.5Y 2/0), woody fragments.	CL		collected first sample at 2.7 feet
5	Clay: trace sand and fine gravel, dk yellowish brown (10YR 4/4), with mottles of dk grayish brown (2.5Y 4/2) and gray (10YR 5/1), low plasticity, firm, moist, <u>Glacial Till</u> .	CL		
	Clay: trace fine to med sand, brown (10YR 5/3) with mottles of gray (10YR 5/1) and red (2.5YR 5/8), low plasticity, hard, moist, <u>Glacial Till</u> .	CL		collected second sample at 7 feet
10	Clay: trace fine gravel and silt, dark gray (10YR 4/1), low plasticity, hard, moist, <u>Glacial Till</u> .	CL		-collected last sample at 14.5 feet -water in bottom of hole, terminated further digging -backfilled hole to surface with excavated soil
15		CL		

Log of Test Pit CSA2TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580C

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/09/91

Date Completed: 02/09/91

Total Depth of Trench: 14.5

Ground Elevation: 670.000

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/09/91	0835	1115	0	14.5





Abbreviations

Abbr.	Meaning
med	medium
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit CSA2TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Clay: little fine to med sand and fine gravel, roots, very dark gray brown (10YR 3/2), low plasticity, soft, moist.	CL		
	Coal: some fine sand and gravel, black (2.5Y 2/0) to black (10YR 2/1) with dk reddish brown (2.5YR 2.5/4).	FM		
	Coal: some fine sand and gravel, black (2.5Y 2/0).			
	Coal: little fine sand, some ash; coal is black (2.5Y 2/0), ash is light gray (10YR 7/1).	CL		
	Clay: little coal, some fine sand and gravel, very dk grayish brown (10YR 3/2), nonplastic, med dense, moist.	CL		collected sample at 2.7 feet
	Clay: trace fine sand, little silt, light olive brown (2.5Y 5/3), low plasticity, firm, moist, <u>Glacial Till</u> .			
	Clay: trace fine sand, gravel, and silt, grayish brown (10YR 5/2) with mottles of gray (5Y 6/1), and yellowish brown (10YR 5/8), low plasticity, firm, moist.			
		CL		collected sample at 7 feet
5	Clay: trace fine sand and silt, dk grayish brown (10YR 4/2) with mottles of gray (10YR 5/1), low plasticity, firm, moist, <u>Glacial Till</u> .	CL		
10	Clay: trace fine sand and silt, dark gray (10YR 4/1), low plasticity, hard, moist, <u>Glacial Till</u> .	CL		collected sample at 14.5 feet
		CL		
15				

Log of Test Pit CSA2TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Jane M. Ballen, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/11/91

Date Completed: 02/11/91

Total Depth of Trench: 14.5

Ground Elevation: 666.123

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching		Per Shift:
	Start	End	Start	End	
02/11/91	0935	1300	0		14.5




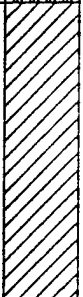

Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit CSA2TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Clayey Silt: few sand, gravel, and small cobbles, mostly brown to dk brown (10YR 4/3) with trace red (2.5YR 5/8) oxidation, low plasticity, firm, slightly moist.	ML		
	Coal: mostly coal interbedded with some clay; little sand; coal is black (2.5Y 2/0), clay is yellowish brown (10YR 5/4), trace red (10R 4/8) oxidation, low plasticity, slightly moist, loose, soft.	FM		
	Coal: mostly coal, some ash, coal is black (2.5Y 2/0), ash is light gray (7.5YR 7/0), trace yellowish red (5YR 5/3) oxidation, nonplastic, loose, slightly moist, very soft.			
5	Silt: mostly silt, little clay, brown (10YR 5/3), low plasticity, slightly moist, loose, very soft.	ML		collected sample at 5.0 feet
	Clay: mostly clay, mostly dark yellow brown (10YR 4/6) with some light gray to gray (10YR 6/1) mottling, low to med plasticity, firm, moist, <u>Glacial Till</u> .	CL		
	Clay: brown (10YR 5/3) and light brown gray (10YR 6/2), low plasticity, firm to hard, moist.	CL		collected sample at 8 feet
10				
15	Clay: gray (10YR 5/1), trace yellowish red oxidation (5YR 5/8), low plasticity, hard, slightly moist.			collected sample at 14.5 feet

GEA 4

Log of Well LF5MW1

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Driller & Company: Pete Buell, ESE, Inc.		
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.		
Drilling Rig: Brat I.		Drilling Method: 6 1/4" HSA
Soil Sampling Device:		
Date Started: 7/08/91	Date Completed: 7/08/91	Total Depth Drilled: 49.05
Water Level While Drilling (bgl): Dry		Ground Elevation: 669.6743

Completion Information

Water Level At Completion (bgl): Dry	Date: 7/08/91
Screened Interval: 28.61-48.58	Filter Pack Interval: 23.0-49.05
Screen Length: 19.97	Bentonite Seal Interval: 18.2-23.0
End Cap Length: 0.31	Grout Interval: 0-18.2
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 31.71	Protective Casing Type: stick-up 6"
Top of Casing Elevation: 673.1812	Protective Casing Length/AG: 5.01/3.7

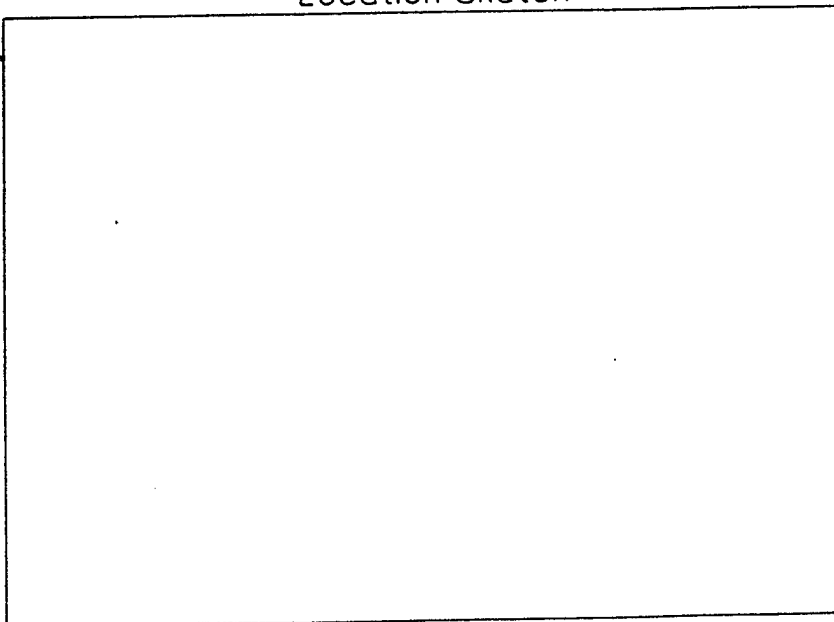
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/08/91	1529	1710	0	49

Abbreviations

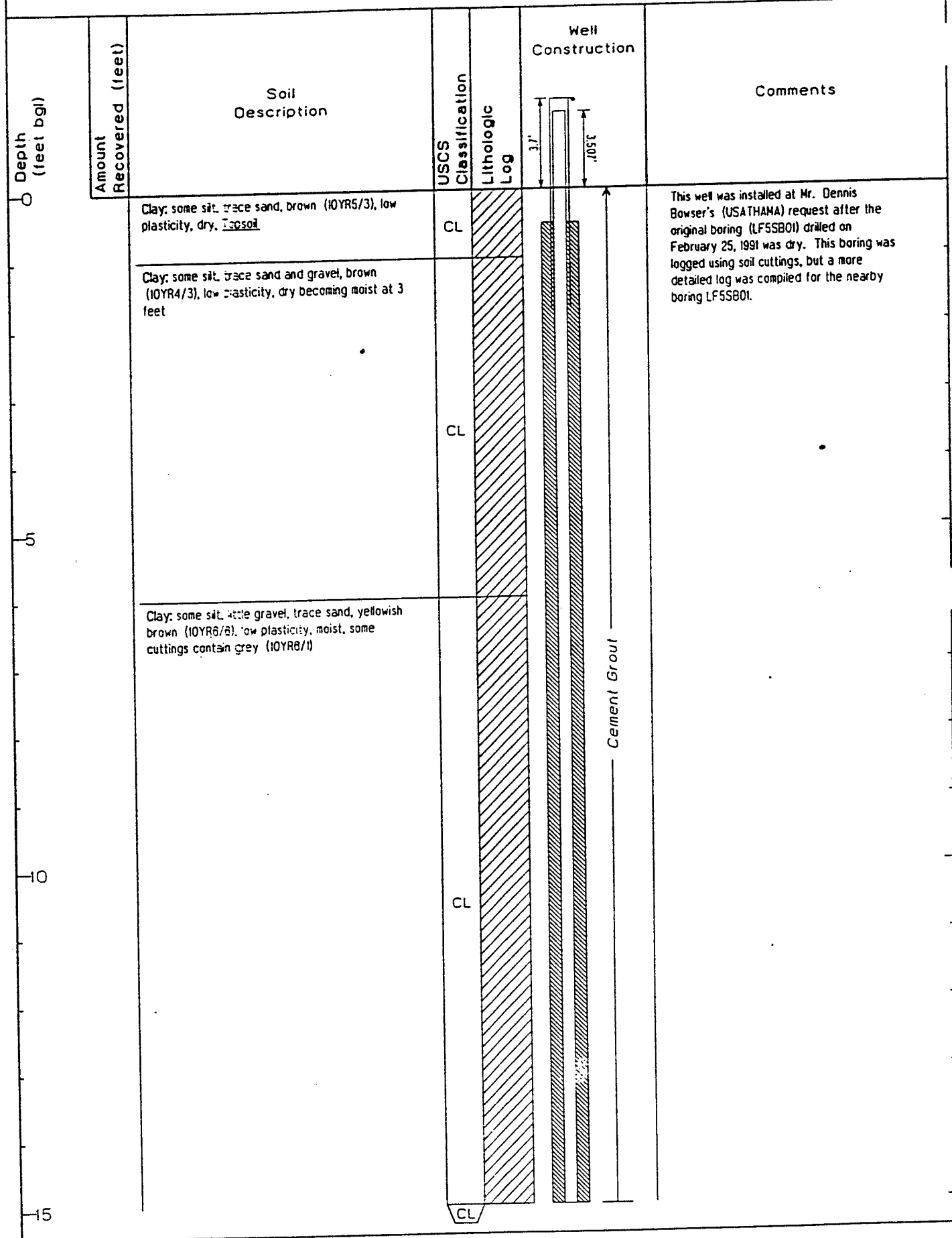
Location Sketch

Abbr.	Meaning
HSA	hollow stem auger
some	25-35%
little	15-25%
trace	<5%



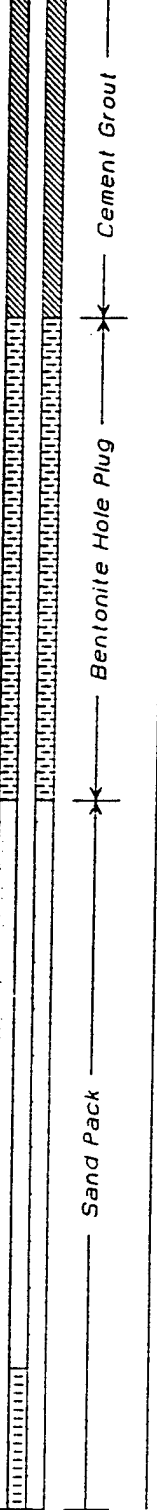
Fort Sheridan RI/FS

Log of Well LF5MW1



Fort Sheridan RI/FS

Log of Well LF5MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification Lithologic Log	Well Construction	Comments
15		Clay, some silt, little small to medium gravel, trace sand, dark grey (10YR4/1), moist	CL		
20					
25					
30					


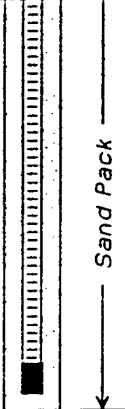
Fort Sheridan RI/FS

Log of Well LF5MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS	Well	Comments
			Classification	Construction	
			Lithologic Log		
30					
35					
40					
45					

Fort Sheridan RI/FS

Log of Well LF5MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS	Lithologic	Well Construction	Comments
			Classification	Log		
45			CL			
50						
55						
60						

Log of Boring LF5 SB01

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Chuck Vermillion, ESE, Inc.

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Drilling Rig: CME-55 (0-50ft), BRAT I (50-64ft) Drilling Method: 6 1/2"

Soil Sampling Device: 3" x 2' Split Spoon

Date Started: 02/24/91 Date Completed: 02/26/91 Total Depth Drilled: 64

Water Level While Drilling (bgl): Ground Elevation: 669.6743

Completion Information

Water Level At Completion (bgl): Date:

Grout Interval: C-34.4

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
02/24/91	0900	1730	0	50
02/25/91	0950	1510	50	64
02/26/91	0900	1020	64	64

Abbreviations

Abbr.	Meaning
dk	Dark
med	Medium
ft	Feet
ID	Inner Diameter
HSA	Hollow Stem Auger
BGL	Below Ground Level
trace	< 5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Boring LF5 SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Silt: little sand, little gravel	ML			No chemical sample taken. One physical sample taken from cuttings.
6		1.5	Sand: little silt, little gravel, mostly dk. gray (10YR 3/1), some red oxidation (2.5YR 4/8), low plasticity, loose, moist, <u>Topsoil</u>	GM			Sample taken
10			Silt: little gravel, few sand, mostly yellowish brown (10YR 5/4), some yellow brown (10YR 5/8), low plasticity, hard, moist, <u>Glacial Till</u>	ML			Description made from cuttings. No sample taken.
11			Clay: some silt, few gravel, yellowish brown (10YR 5/4), low plasticity, hard, moist, <u>Glacial Till</u>	CL			Sample taken
		1.85	Clay: some silt, few sand, few gravel, mostly yellow brown (10YR 5/4) with mottles of lt. gray (10YR 6/1) and red (2.5YR 5/8), low plasticity, hard, slightly moist, <u>Glacial Till</u>	CL			Description made from cuttings. No sample taken.
			Some Silt, some Clay, little gravel, yellowish brown (10YR 5/4), low plasticity, firm, moist, <u>Glacial Till</u>	ML CL			Sample taken
10		2.0	Silt: some clay, little gravel, mostly yellowish brown (10YR 5/4), mottled with gray (10YR 5/1), low plasticity, hard, slightly moist, <u>Glacial Till</u>	ML			Description made from cuttings. No sample taken.
18			Silt: some clay, little gravel, brown (10YR 5/3), low plasticity, firm, moist, <u>Glacial Till</u>	ML			Sample taken
28							
33							
		1.8	Silt: some clay, little sand, little gravel, brown (10YR 5/3), low plasticity, hard, slightly moist, <u>Glacial Till</u>	ML CL			
12							
20							
15							

Cement Grout

Fort Sheridan RI/FS

Log of Boring LF5 SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15							
23	1.8		Clay; some silty, some gravel, mostly dk. gray (10YR 4/1), mottled with strong brown oxidation (7.5YR 5/6), low plasticity, hard, slightly moist, <u>Glacial Till</u>	CL			
29							Sample taken
6			Clay; few silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>	CL			
10	1.85						
16							
18			Clay; few silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>				Description made from cuttings. No sample taken.
20				CL			
7			Clay; few silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>				Sample taken
11	2.0			CL			
14							
15			Clay; little silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>				Description made from cuttings. No sample taken.
25				CL			
6			Clay; little silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>				Sample taken
8	2.0			CL			
12							
16				CL			

Cement Grout

Fort Sheridan RI/FS

Log of Boring LF5 SB01

Depth (feet bgl)	Blow Counts		Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
	Blow	Counts						
30				Clay: little silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>	CL			Description made from cuttings. No sample taken.
12			2.0	Clay: little silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
16								
18				Clay: little silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>	CL			Description made from cuttings. No sample taken.
35								
10			2.0	Clay: little silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
13								
15								
20				Clay: little silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
7			2.0					
14								
16								
40				Clay: few silt, few gravel, dk. gray (10YR 4/1), low plasticity, firm, slightly moist, <u>Glacial Till</u>	CL			Sample taken
9			2.0					
15								
19								
23				Clay: few silt, few gravel, dk. gray (10YR 4/1), low plasticity, firm, slightly moist, <u>Glacial Till</u>	CL			Sample taken
7			2.0					
14								
20								
21				Clay: few silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, wet in some areas but not all the way through, <u>Glacial Till</u>	CL			Sample taken
9			2.0					
45								





Fort Sheridan RI/FS

Log of Boring LF5 SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
45	17	2.0		CL			
	20						
	1	1.4	Clay: few silt, few gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist, <u>Glacial Till</u>	CL			Rods slipped. Blow count undeterminable. Sample was taken.
	9		Clay: little silt, little gravel, dk. gray (10YR 4/1), low-med plasticity, firm, moist inside with wet spots outside, <u>Glacial Till</u>	CL			Sample taken
	12	2.0		CL			
	18						
50	23		Clay: few silt, little gravel, dk. gray (10YR 4/1), low plasticity, firm, moist, wet around edges, <u>Glacial Till</u>	CL			Dropped rod. First 18" of blow counts are undeterminable. Sample was taken.
		1.4		CL			
	16		Clay: few silt, little gravel, dk. gray (10YR 4/1), low plasticity, very firm, moist, <u>Glacial Till</u>	CL			Sample taken
	10						
	22	2.0		CL			
	34						
	35		Clay: few silt, few gravel, dk. gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
	4						
55	12	1.7		CL			
	22						
	22		Clay: few silt, few gravel, dk. gray (10YR 4/1), low plasticity, hard, moist, <u>Glacial Till</u>	CL			Sample taken
	8						
	17	2.0		CL			
	22						
	30		Clay: few silt, few gravel, few muscovite, dk. gray (10YR 4/1), low plasticity, hard, moist, <u>Glacial Till</u>	CL			Sample taken
	8						
	20	2.0		CL			
	24						
60	27			CL			

Fort Sheridan RI/FS

Log of Boring LF5 SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
00							
7			Clay: few silt, few gravel, few muscovite, dk. gray (10YR 4/1), low plasticity, hard, moist, <u>Glacial Till</u>	CL			No sample taken, spoon used for description only.
15		2.0					
20							
30			Clay: few silt, few gravel, dk. gray (10YR 4/1), low plasticity, very firm, hard, moist, <u>Glacial Till</u>	CL			Sample taken.
12							
19		2.0					
24							
47							
65							
70							
75							

Log of Well LF5 MW02

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Chuck Vermillion, ESE, Inc.

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 02/19/91 Date Completed: 02/21/91

Total Depth Drilled: 54

Water Level While Drilling (bgl): 48.40

Ground Elevation: 664.01C

Completion Information

Water Level At Completion (bgl): 55.73	Date: 02/21/91
Screened Interval: 43.80-53.85	Filter Pack Interval: 37.75-56.67
Screen Length: 10	Bentonite Seal Interval: 32.00-37.75
End Cap Length: 0.15	Grout Interval: 0-32.00
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 46.65	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 666.453	Protective Casing Length/AG: 5/2.96

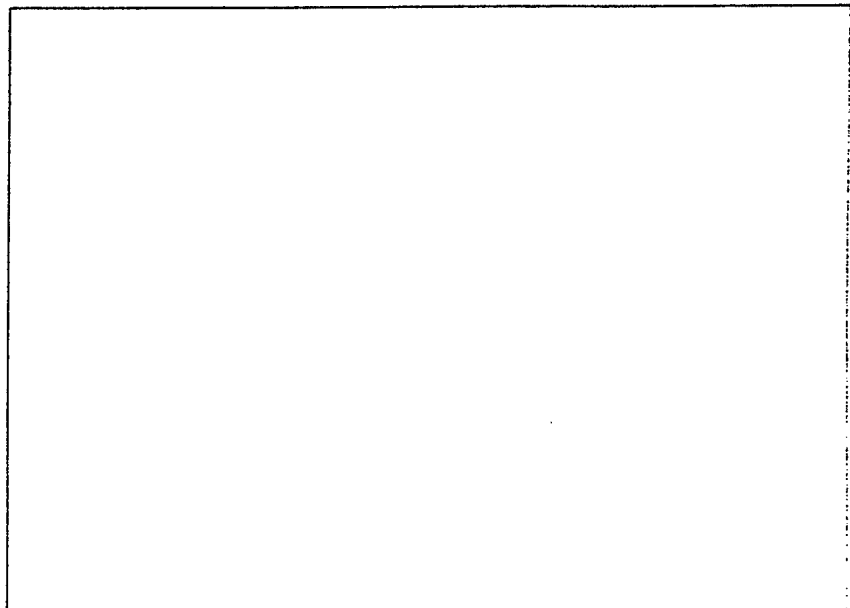
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
02/19/91	1427	1800	0	20
02/20/91	0900	1945	20	54
02/21/91	0940	1230	54	54

Abbreviations

Abbr.	Meaning
lg	large
sm	small
med	medium
dk	dark
ID	Inner Diameter
HSA	Hollow Stem Auger
BGL	Below Ground Level
trace	< 5%
few	5-10%
little	15-25%
some	30-40%
mostly	50-100%

Location Sketch



Fort Sheridan RI/FS

Log of Well LF5 MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0							
7			Sand: fine to med grain, some small to large gravel, little brick, trace of roots, yellowish brown (10YR 5/4), slightly moist, <u>Topsoil</u>	SW			Sample taken
17	2.0		Silt: some clay, little sand, little fine to med gravel. Some mottling, mostly dk. gray (10YR 4/1), little light gray (10YR 7/2), few dark yellowish brown (10YR 3/4). Low plasticity, moist, <u>Glacial Till</u>	ML			Sample taken
10							
5							
3			Clay: few small gravel, brown (10YR 5/3), mottled with light gray (10YR 7/1), yellowish red (5YR 5/8), yellow (10YR 7/5), low plasticity, very moist, <u>Glacial Till</u>	CL			
4	2.0						
6							
10			Clay: little sand, few small to large gravel, mostly light yellow brown (10YR 6/4), mottled with some light gray (10YR 7/1), few yellowish red (5YR 5/8), low plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
7							
10	1.8						
12							
19			Clay: little fine-grain sand, little silt, little small gravel, mostly light brownish gray (10YR 6/2), mottled with some yellowish red (5YR 5/8), low plasticity, very firm, moist, <u>Glacial Till</u>	CL			Sample taken
5							
10	1.9						
12							
14			Clay: little silt, little small to med gravel, mostly light brownish gray (10YR 6/2), mottled with some strong brown (7.5YR 5/8), little gray (10YR 6/1), low plasticity, hard, <u>Glacial Till</u>	CL			Sample taken
12							
18	1.95						
24							
36			Clay: little silt, little small to med gravel, mostly light brownish gray (10YR 6/2), mottled with some strong brown (7.5YR 5/8), little light gray to gray (2.5Y 6/1), low plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
6							
19	1.9						
25							
31			Clay: few silt, few small gravel, mostly dk. gray (10YR 4/1), little red oxidation vein (2.5YR 4/8), low to med plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
12							
11	1.9						
17							
15			Clay: few silt, few small gravel, mostly dk gray (10YR 4/1), mottled with some yellowish brown (10YR 5/4), low plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
6	1.9						
10							

Fort Sheridan RI/FS

Log of Well LF5 MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
15		1.9		CL			
18							Sample taken
7			Clay: little silt to med gravel, few silt, mostly dk. gray (10YR 4/1), with little yellow brown oxidation veins (10YR 5/8), low to med plasticity, firm, moist, <u>Glacial Till</u>	CL			
11		2.0					
15							
19							Sample taken
19			Clay: few silt, few small gravel, mostly dk. gray (10YR 4/1), with yellow brown oxidation vein (10YR 5/8), low to med plasticity, firm, moist, <u>Glacial Till</u>	CL			
14		2.0					
13							
20							Sample taken
17							
6			Clay: few silt, little fine to med gravel, mostly dk. gray (10YR 4/1), with yellow brown oxidation vein (10YR 5/8) running lengthwise, low to med plasticity, firm, moist, <u>Glacial Till</u>	CL			
11		2.0					
16							
19							Sample taken
5			Clay: few silt, few small to med gravel, few small pyrite crystals, dk. gray (10YR 4/1), low plasticity, firm, slightly moist, <u>Glacial Till</u>	CL			
10		2.0					
12							
18							Sample taken
11			Clay: few silt, few small gravel, dk. gray (10YR 4/1), low plasticity, firm, slightly moist, <u>Glacial Till</u>	CL			
15		2.0					
23							
23							Sample taken
8			Clay: few silt, few small gravel, dk. gray (10YR 4/1), low plasticity, firm, slightly moist, <u>Glacial Till</u>	CL			
13		2.0					
16							
21							Sample taken
9			Clay: few silt, few small gravel, 1 large gravel taken from middle of split spoon, dk. gray (10YR 4/1), low plasticity, firm, slightly moist, <u>Glacial Till</u>	CL			Note- some very moist clay around edges. Possible run-off water from last night. Will continue to watch.
9		2.0					
12							
30				CL			

Fort Sheridan RI/FS

Log of Well LF5 MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
30							
5			Clay: few silt, few small to med gravel, dk. gray (10YR 4/1), low plasticity, firm, moist to very moist, <u>Glacial Till</u>	CL			Sample taken
9		2.0					
13							
15			Clay: few silt, few small to med gravel, dk. gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u>	CL			Sample taken
8							
12		2.0					
14							
20			Clay: few silt, few small to med gravel, dk. gray (10YR 4/1), low plasticity, firm moist <u>Glacial Till</u>	CL			Sample taken
8							
35							
13		2.0		CL			
18							
21			Clay: few silt, few small to med gravel, dk. gray (10YR 4/1), low plasticity, firm, moist, very moist last 6 inches and wet on outside, <u>Glacial Till</u>	CL			Sample taken The hammer is sinking the spoon into the clay approximately 2" before blow counts start.
5							
10		2.0		CL			
13							
16			Clay: few silt, few small to med gravel, 1 large piece of gravel near end of sample, dk. gray (10YR 4/1), low plasticity, firm, moist, some very moist spots at both ends on outside of sample, <u>Glacial Till</u>	CL			Sample taken
7							
12		2.0					
14							
40							
20			Clay: few silt, few small to med gravel, dk. gray (10YR 4/1), low plasticity, firm, very moist at either end and dries towards the middle, <u>Glacial Till</u>	CL			Sample taken
7							
10		2.0		CL			
11							
16			Clay: few silt, few small to med gravel, dk. gray (10YR 4/1), low plasticity, very firm, moist, some very moist spots on outside towards the bottom, <u>Glacial Till</u>	CL			Sample taken
6							
13		2.0		CL			
17							
20			Clay: little silt, few med-grain sand, few small to med gravel, dk. gray (10YR 4/1), low plasticity, hard, moist, <u>Glacial Till</u>	CL			Sample taken
7		2.0					
45							
14							

Fort Sheridan RI/FS

Log of Well LF5 MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
45							
20	2.0			CL			
26							
10			Clay: little silt, few med-grain sand, few small to med gravel, dk. gray (10YR 4/1), low plasticity, hard, moist, <u>Glacial Till</u>	CL			Sample taken
18	2.0						
22							
23			Silt: little clay, little med-grain sand, dk. gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u>	ML			
6			Silt: little clay, little sand, dk. gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u>	ML			Sample taken. Two physical samples were taken: 1)48.0-48.4 2)48.4-50.0
7	2.0		Sand: little silt, some small gravel, subangular sand and gravel, sand is med to coarse, dk gray (10YR 4/1), low plasticity, very soft, (noncohesive, loose), very moist, <u>Glacial Stream Deposit</u>	SP			
14							
50							
14							
7			Sand: some small to med gravel, med grain sand, subangular sand and gravel, dk. gray (10YR 4/1), low plasticity, loose wet, <u>Glacial Stream Deposit</u>	SP			Sample taken. Two physical samples were taken: 1)50.0-51.0 2)51.0-52.0
7	1.9						
13			Silt: few clay, few sand, grayish brown (10YR 5/2), low plasticity, firm, moist, <u>Glacial Till</u>	ML			
16							
14			Clay: little silt, dk. gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u>				Sample taken
20	2.0			CL			
25							
26							
10			Clay: few silt, dk. gray (10YR 4/1), low plasticity, hard, very moist, <u>Glacial Till</u>				Sample taken
55							
13	2.0			CL			
20							
24							
60							

Sand Pack

Log of Well LF5SB03/MW03

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: Eric Bowman, ESE, Inc.	
Drilling Rig: CME-3	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2" Split Spoon	
Date Started: 02/06/91	Date Completed: 02/06/91
Total Depth Drilled: 15.37	
Water Level While Drilling (bgl): 6.0	Ground Elevation: 641.893

Completion Information

Water Level At Completion (bgl):	Date: 02/06/91
Screened Interval: 4.39-14.68	Filter Pack Interval: 3.10-15.37
Screen Length: 10.03	Bentonite Seal Interval: 1.0-3.10
End Cap Length: 0.15	Grout Interval: 0-1.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 4.72	Protective Casing Type: flush mount
Top of Casing Elevation: 641.62	Protective Casing Length/AG: 1/0

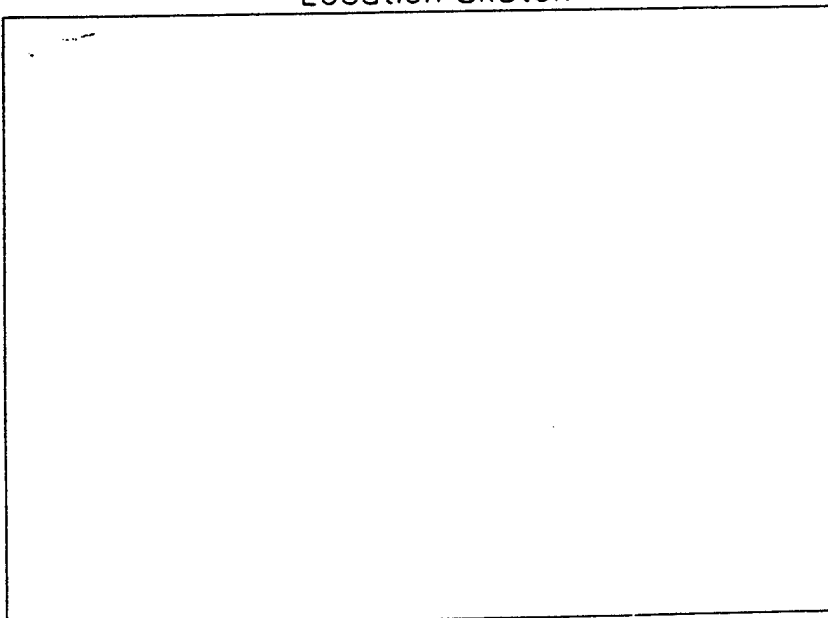
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
02/06/91	0900	1545	0	16

Abbreviations

Abbr.	Meaning
NL	Not Logged
med	medium
PID	Photoionization Detector
HSA	Hollow Stem Auger
REC	recovery
ppm	part per million
trace	< 5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch




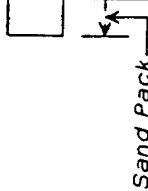
Fort Sheridan RI/FS

Log of Well LF5SB03/MW03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0				NL			split spooning started after first 2' because of asphalt and road base.
4			Clay: few sand and gravel, brown (10YR 4/3), med. plasticity, firm to hard, moist, <u>Till</u> .	CL			REC: 85% PID: 0 ppm
5	1.7						
6							
9			Clay: trace sand and gravel, mottled grey-brown, med. plasticity, firm, <u>Till</u> .	CL			REC: 100% PID: 0 ppm
3							
5	2.0						
7							
9			Clay: trace sand and gravel, grey (10YR 5/1), high plasticity, very moist, <u>Till</u> .	CL			first water at 6' REC: 100% PID: 0 ppm
2							
3	2.0						
7							
10			Clay: trace sand, silt, gravel, grey (10YR 5/1), high plasticity, very moist, <u>Till</u> .	CL			split spoon encountered large piece of gravel causing only 50% recovery. REC: 50% PID: 0 ppm
7							
11	1.0						
12							
17			Clay: few gravel, trace sand and silt, grey (10YR 5/1), firm, high plasticity, moist, <u>Till</u> .	CL			observed 3.1 ppm peak in auger annulus after bit was retracted. REC: 100% PID: 0 ppm
2							
5	2.0						
7							
10			Clay: few gravel, trace sand and silt, grey (10YR 5/1), firm, high plasticity, moist, <u>Till</u> .	CL			REC: 100% PID: 0 ppm
3							
7	2.0						
13							
14			Clay: few gravel, trace sand and silt, grey (10YR 5/1), hard, low-med plasticity, moist, <u>Till</u> .	CL			at 15', a 1/4" fine, grey, well-sorted sand was encountered.
4	2.0						
15	11						

Fort Sheridan RI/FS

Log of Well LF5SB03/MW03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15	19	2.0		CL			
21							
20							
25							
30							

Log of Well LF5SB04D/MW04D

Fort Sheridan RI/FS
Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: Eric Bowman, ESE, Inc.	
Drilling Rig: CME-3	Drilling Method
Soil Sampling Device: 3" x 2" Split Spoon	
Date Started: 02/07/91	Date Completed: 02/08/91
Total Depth Drilled: 38.65	
Water Level While Drilling (bgl): 22.6	Ground Elevation: 628.763

Completion Information

Water Level At Completion (bgl):	Date: 02/07/91
Screened Interval: 26.49-36.09	Filter Pack Interval: 20.08-38.65
Screen Length: 10.1	Bentonite Seal Interval: 14.83-20.08
End Cap Length: 0.15	Grout Interval: 0-14.83
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 26.1	Protective Casing Type: flush mount
Top of Casing Elevation: 628.600	Protective Casing Length/AG: 1/0

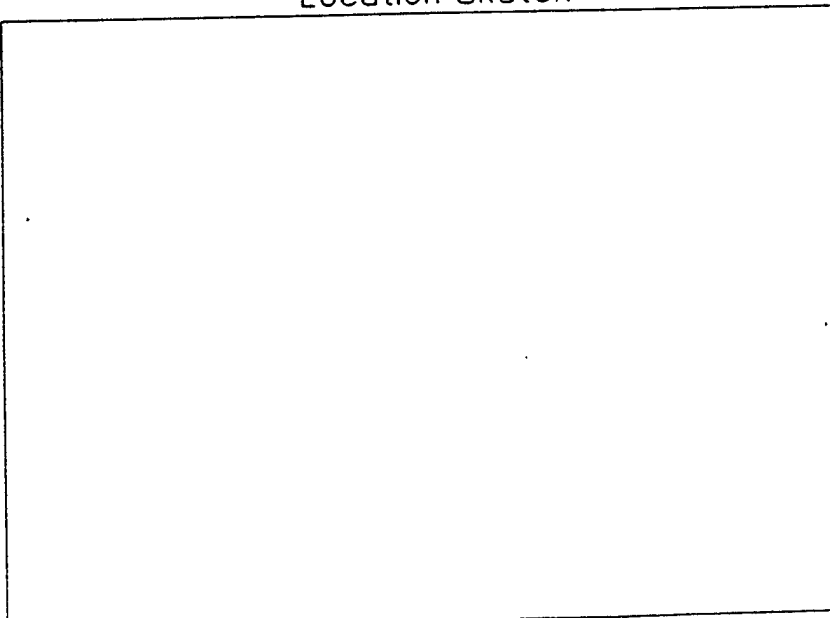
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
02/07/91	0900	1745	0	30
02/08/91	0815	1800	30	38

Abbreviations

Location Sketch

Abbr.	Meaning
NL	Not Logged
med	medium
apx	approximately
PID	Photoionization Detector
HSA	Hollow Stem Auger
REC	recovery
BHP	Bentonite Hole Plug
ppm	part per million
trace	< 5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%



Fort Sheridan RI/FS

Log of Well LF5SB04D/MW04D

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0				NL			bored 0 - 2' to pass through road base; slag fill with 2 - 3" gravel.
5		2.0	Clay: little sand silt, gravel, dark gray (10YR 4/1), high plasticity, med dense, moist, <u>Till</u> .	CL			REC: 100% PID: 0 ppm
5		2.0	Clay: 4 - 5': little sand, silt, and gravel, mottle gray-brown, med dense, high plasticity, moist, <u>Till</u> . Sand: 5 - 5.1': some clay, little gravel and silt, subangular grains, <u>Unsorted Till</u> . Clay: 5.1 - 6': little sand and silt, trace gravel, grey (10YR 5/1), hard, moist, <u>Till</u> .	CL SC			observed water after retracting spoon. REC: 100% PID: 0 ppm
13		2.0	Sand: 6.1 - 6.3': little silt, some gravel, trace clay, unsorted dark grey, moist, <u>Till</u> . Clay: 6.3 - 6.6': some sand and silt, mottled grey-brown, moist, high plasticity. Sand: 6.6 - 6.8': some silt and gravel, trace clay, dark red-brown, dry, unsorted. Clay: 6.8 - 8.0': trace sand, silt, and gravel, grey (10YR 5/1), moist, homogenous, firm, med plasticity, <u>Till</u> .	SP CF			REC: 100% PID: 0 ppm
13		2.0	Clay: little silt, gray (10YR 5/1), high plasticity, hard-firm, moist, <u>Wet Till</u> .	CL			clay has differential hardness: soft to very hard. REC: 100% PID: 0 ppm
14		2.0	Clay: trace gravel, little silt, grey (10YR 5/1), med plasticity, hard, moist, <u>Till</u> .	CL			clay appears to be drying with depth. REC: 100% PID: 0 ppm
16		2.0	Clay: trace gravel and silt, grey (10YR 5/1), med plasticity, hard, moist, <u>Till</u> .	CL			REC: 100% PID: 0 ppm
22		2.0	Clay: 14 - 14.9': trace silt, sand, and gravel, med plasticity, grey (10YR 5/1), moist, hard, <u>Till</u> . Sand: 14.9 - 14.97': some silt, fine-grained, well-sorted, well-rounded till sand, grey with white sand grains.	CL			clay upon closer inspection had several very fine sand stringers present. sample had a linseed oil odor but no PID detections. REC: 100% PID: 0 ppm

Fort Sheridan RI/FS

Log of Well LF5SB04D/MW04D

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15							
15	2.0		Clay: 14.9' - 16': trace sand and silt, med plasticity, grey (10YR 5/1), hard, moist, <u>Till</u>	CL			
19							
7			Clay: trace sand, some silt, grey (10YR 5/1), med plasticity, firm, moist, <u>Till</u>	CL			several fine sand stringers. REC: 100% PID: 0 ppm
13	2.0						
16							
21			Clay: trace sand, some silt, grey (10YR 5/1), med plasticity, firm, moist, <u>Till</u>	CL			clay same as above 8'. REC: 100% PID: 0 ppm
6							
12	2.0						
17							
20			Clay: some silt and sand (very fine), grey (10YR 5/1), low plasticity, hard, moist, <u>Till</u>	CL			sand and silt content increasing but only slightly moist. no sand stringer present. REC: 100% PID: 0 ppm
8							
14	2.0						
18							
22			Silt: trace clay, grey (10YR 5/1), dense, moist, <u>Till</u>	SM			encountered silt at 22.4'. clay above 22.4' is same as above. very tip of spoon is very moist. water level check: apx 1" collecting in hole at 20 minutes. REC: 100% PID: 0 ppm
11							
20	2.0						
27							
30			Silt: trace clay, grey (10YR 5/1), low plasticity, dense, moist (drier than above), <u>Till</u>	SM			silt appears dryer than last interval. REC: 100% PID: 0 ppm
10							
25	2.0						
24							
25			Silt: trace clay, grey (10YR 5/1), low plasticity, dense, moist, <u>Till</u>	SM			silt is maintaining similar moisture content as above. REC: 100% PID: 0 ppm
10							
21	2.0						
26							
33			Silt: trace clay, little gravel, grey (10YR 5/1), low plasticity, dense, moist, <u>Till</u>	SM			silt moisture is about the same. gravel starts at apx. 28.35'. REC: 100% PID: 0 ppm
11							
17	2.0						
25							
30							

Log of Well LF5SB04D/MW04D

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Log of Well LF5SB04S/MW04S

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: Eric Bowman, ESE, Inc.	
Drilling Rig: CME-3	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2" Split Spoon	
Date Started: 02/09/91	Date Completed: 02/09/91
Total Depth Drilled: 15.07	
Water Level While Drilling (bgl):	Ground Elevation: 628.981

Completion Information

Water Level At Completion (bgl):	Date:
Screened Interval: 5.10-14.74	Filter Pack Interval: 2.10-15.07
Screen Length: 9.93	Bentonite Seal Interval: 0.90-2.10
End Cap Length: 0.15	Grout Interval: 0-0.90
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 4.61	Protective Casing Type: flush mount
Top of Casing Elevation: 628.730	Protective Casing Length/AG: 1/0

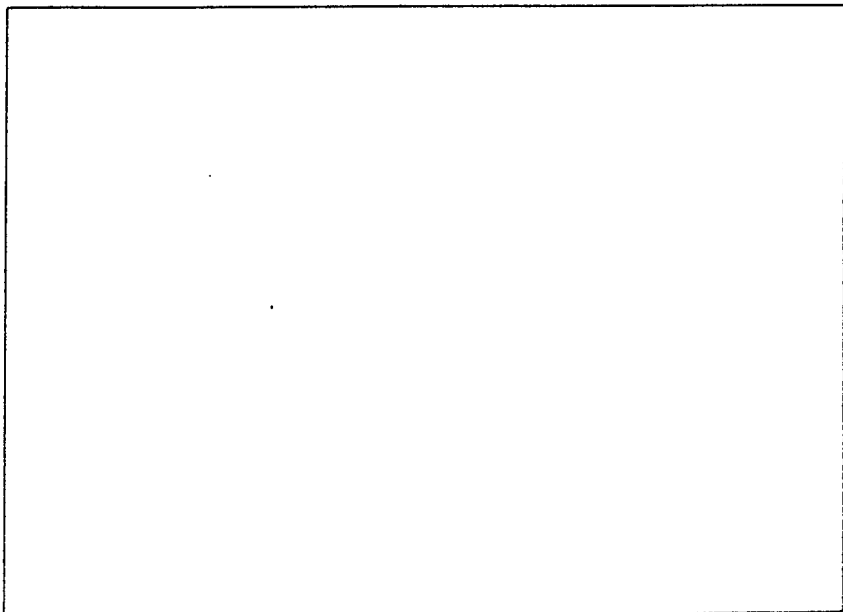
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
02/09/91	1000	1515	0	15

Abbreviations

Abbr.	Meaning
NL	Not Logged
med	medium
SS	Soil Sample
BSL	Below Surface Level
PID	Photoionization Detector
HSA	Hollow Stem Auger
REC	recovery
ppm	part per million
trace	< 5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch




Fort Sheridan RI/FS

Log of Well LF5SB04S/MW04S

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0				NL			SS starts at 2-4' to pass road base.
9			Clay: little silt, few sand, trace gravel, grayish-brown (2.5Y 5/2), medium plasticity, firm, moist, <u>Platy Till</u> .	CL			REC: 60%
10	1.2						
9							
9			Clay: little silt, few sand, trace gravel, grayish-brown (2.5Y 5/2), medium plasticity, firm, moist, <u>Platy Till</u> .	CL			4-6" moister than 2-4'. PID in auger at 7.3 ppm after drilling (4-6'). REC: 100% PID: 0 ppm
3							
4	2.0						
7							
13			Clay: some silt, trace sand and gravel, dark gray (10YR 4/1), medium plasticity, firm, moist, <u>Till</u> .	CL			moisture is about the same as SS-2. REC: 100% PID: 0 ppm
5							
7	2.0						
10							
13			Clay: little silt, trace sand and gravel, dark gray (10YR 4/1), medium plasticity, firm, moist, <u>Till</u> .	CL			moisture is about the same as above, small sand stringer present, wet, but very small < 1/8". REC: 100% PID: 0 ppm
4							
9	2.0						
15							
17			Clay: little silt, trace gravel, gray (10YR 5/1), medium plasticity, moist, hard, <u>Till</u> .	CL			clay has coarse to very coarse gravel up to 1". angular shales and limestone/dolomite chunks. absence of sand stringers. REC: 100% PID: 0.4 ppm
3							
9	2.0						
11							
17			Clay: trace silt, trace gravel, gray (10YR 5/1), low-med plasticity, moist, hard, <u>Till</u> .	CL			one very fine sand stringer at about 12.5'. silt seems to be decreasing. REC: 100% PID: 0.4 ppm
10							
10	2.0						
18							
20			Clay: trace silt and gravel, gray (10YR 5/1), low-med plasticity, moist, hard, <u>Till</u> .	CL			REC: 100%
6	2.0						
15	9						

Fort Sheridan RI/FS

Log of Well LF5SB04S/MW04S

Depth (feet bgl)	Blow Counts		Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15	19	2.0	19		CL		Sand Pack	

Log of Well B208 MWO1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: James S. Guentert, ESE, Inc.	
Drilling Rig: CME-55	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3"x2' Split spoon sampler	
Date Started: 11/27/90	Date Completed: 11/28/90
Total Depth Drilled: 8.2	
Water Level While Drilling (bgl):	Ground Elevation: 668.593

Completion Information

Water Level At Completion (bgl):	Date: 11/28/90
Screened Interval: 2.00-7.00	Filter Pack Interval: 0.9-8
Screen Length: 5	Bentonite Seal Interval: 0.65-0.9
End Cap Length: 0.20	Grout Interval: 0.45-0.65
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 1.60	Protective Casing Type: Flush Mount
Top of Casing Elevation: 668.127	Protective Casing Length/AG: 12/0.00

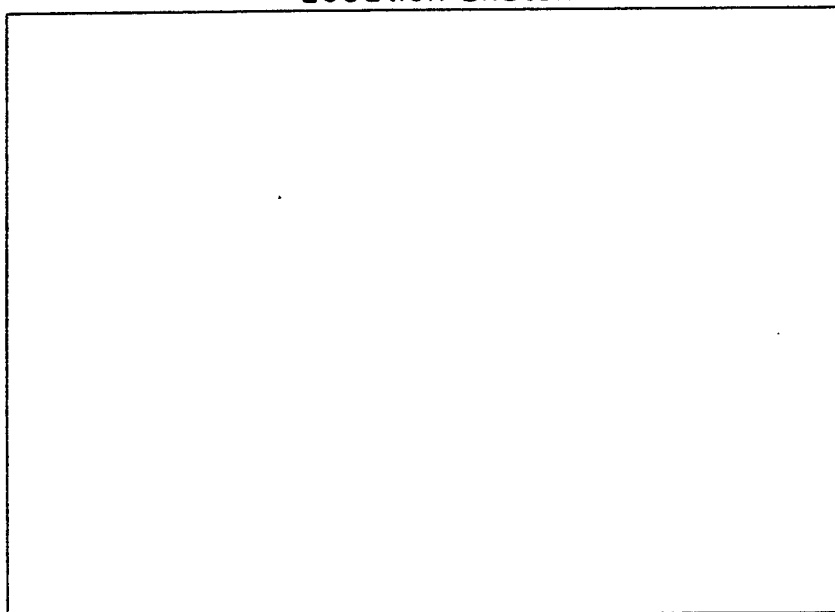
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/27/90	1411	1600	0	4
11/28/90		1500	4	8

Abbreviations

Abbr.	Meaning
3xSS	3" x 2' Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch



Fort Sheridan RI/FS

Log of Well B208 MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Asphalt	FM			11/27/90 Drilled through Asphalt Collected 3"x2" SS @ 0'-2' Removed auger, H ₂ O trickling into borehole from gravel zone
4		1.3'	Sand-Gravel Mixture: 40% sand (fine-coarse), 50% gravel (small-medium), 10% silt and clay, yellowish brown (10YR 5/6), non-plastic, loose, moist-sat., angular-subangular, <u>Asphalt Base</u> .	FM			
5							
7			Sandy Clay: 40% sand (F-M), olive brown (10YR 4/4), low plasticity, medium stiff, dry-moist.	CL			Collected 3"x2" SS @ 2'-4' Through the open borehole water coming into borehole primarily @ 1.8 feet-2.0 feet. Drilled down to 4 feet
4		1.8'	Clay: with silt, 15-20%, 5% fine-medium sand, dark yellowish (10YR 4/6), low plasticity, dry, no bedding; Hydrocarbon odor, 5 ppm OVM reading upon opening spoon.	CL			
4							
7							
10			Clay: with silt 15%, 5% fine-medium sand, mottled, light gray (10YR 7/1) and yellowish brown (10YR 4/6), low plasticity, stiff, dry, no bedding.	CL			Hydrocarbon odors at top of augers 3"x2" SS @ 4'-6" Lightning / Thunder - Shutdown 11/28/90 Setting up Drilled down to 6 feet
4		1.8'					
8							
15							
20			Silty Clay: 20-25% silt, 5% fine-coarse sand, <5% small gravel, mottled yellowish brown (10YR 5/6) and gray (10YR 5/1), low plasticity, medium stiff-stiff, dry, no bedding, slight hydrocarbon odor, gray is primary color.	CL			3"x2" @ 6'-8" Water in borehole and augers @ 2' BGL. Drilled down to 8 feet
7		2.0'					
9							
13							
16			Silty Clay: 20-25% silt, 5-10% fine-coarse sand, dark yellowish brown (10YR 4/4), low plasticity, v. stiff-hard, dry, no bedding, <u>Clay Till</u> .	CL			3"x2" @ 8-10 feet Strong Hydrocarbon odor coming out of borehole w/cuttings
9		2.0'					
14							
26							
34							Bailing viscous H ₂ O out of augers prior to installing well. Measured to bottom of borehole = 8.2' Measured bottom of hole 8.2 feet - some collapse @ bottom of borehole. Begin installing well. Sand is bridging between augers and casing, added total of 1/2 bag - this in combination w/clay laden liquid resulted in decision to pull well and redrill hole and grout off. 11/28/90 Pulled well Drilled back down to 8 feet, will grout off Mixing Grout 30 Gallons of H ₂ O 4 Bags of Cement 15 lbs of Bentonite Powder Treme grout through augers from 8 feet bgl to surface Move rig over (north) 3.5' drilling down to 8 feet to set well Installed well

Log of Well B208 MW02

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3"x2" Split spoon sampler

Date Started: 11/26/90 Date Completed: 11/28/90

Total Depth Drilled: 10.5

Water Level While Drilling (bgl):

Ground Elevation: 668.593

Completion Information

Water Level At Completion (bgl): 6.5	Date: 11/28/90
Screened Interval: 5.2-10.2	Filter Pack Interval: 4.1-10.5
Screen Length: 5	Bentonite Seal Interval: 2.3-4.1
End Cap Length: 0.20	Grout Interval: 0.6-2.3
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 4.6	Protective Casing Type: Flush Mount
Top of Casing Elevation: 668.127	Protective Casing Length/AG: 12/0.00

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/27/90	1411	1600	0	4
11/28/90		1500	4	8

Abbreviations

Location Sketch

Abbr.	Meaning
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Fort Sheridan RI/FS

Log of Well B208 MW02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Asphalt	FM			11/28/90 Drilled through Asphalt 3"x2" SS @ 0'-2' Drilled down to 2 feet
16	1.3'		Sand-Gravel Mixture; 40% sand (fine-coarse), 50% gravel (small-medium), 10% silt and clay, yellowish brown (10YR 5/8), non-plastic, loose, dry-moist, sand-gravel is angular-subangular, Asphalt Base.	GW			
12				CL			
20			Sandy Clay: 25% fine-coarse sand, 10% small gravel, black (10YR 2/1), low plasticity, medium stiff, dry, no bedding, <u>Fit material</u> .	OL			3"x2" SS @ 2'-4' Drilled down to 4 feet No saturated cuttings or H ₂ O in augers
5							
6	2.0'		Silty Clay: 25% silt, <5% fine sand, black (10YR 2/1), low plasticity, soft, dry, red ceramic tile pieces, tar paper, <u>Fit material</u> - organic rich.	OL			
7							
9							
4			Clay: w/silt 10-15%, 5% fine-coarse sand, dark olive brown (2.5Y 3/3), low-medium plasticity, soft, dry, some roots in upper 0.5', grayish and somewhat stiffer, last 0.3 feet.	CL			3"x2" SS @ 4'-6' Drilled down to 6 feet
5	2.0'						
6							
8							
11			Clay: with silt 10%, and 10% fine sand, mottled Gray (10YR 5/1) and yellowish brown (10YR 5/8), low-medium plasticity, medium stiff, dry, no bedding.	CL			3"x2" @ 6'-8' Drilled down to 8 feet
5							
9	2.0'						
11							
12			Clay: with silt 10%, 5% fine-coarse sand and <5% small gravel, yellowish brown (10YR 5/8), low-medium plasticity, medium stiff - stiff, dry, no bedding.	CL			3"x2" @ 8'-10 feet Water coming into augers at a fairly strong rate, after removing 8'-10" sample Depth to H ₂ O @ 8.1' BGL after 10 minutes. - Split Spoon sample appears dry in the interior - no apparent saturated zone (?) at this interval. Drilled down to 10 feet.
6							
11	2.0'						
13							
17			Silty Clay: 20-25% silt, 5% fine-coarse sand, <5% small-large gravel, dk. yellowish brown (10YR 4/4), low plasticity, stiff, dry, no bedding, <u>Clay</u> <u>Till</u> .	CL			3"x2" @ 10-12 feet
10							
4							
9	2.0'						
14							
19							Preparing to install well. (bottom/borehole 10.5' BGL) Screen planned for 5'-10' BGL Casing = 4.8' Screen = 5.0' Bottom Plug = 0.2' Added 1 st bag of sand through augers Added 2 nd bag of sand through augers Added 1/2 bag of sand Sandpack to 4.1' BGL Added bentonite hole plug to 2.3' BGL Depth to water @ 6.5' Cut asphalt around borehole 2"x2" 11/28/90 Mixed cement/bentonite ("neat") grout

Log of Well B208 MW03

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: James S. Guentert, ESE, Inc.	
Drilling Rig: CME-55	Drilling Method: 6 1/4" HSA
Soil Sampling Device: 3" x 2' Split spoon sampler	
Date Started: 11/30/90	Date Completed: 11/30/90
Total Depth Drilled: 24.2	
Water Level While Drilling (bgl):	Ground Elevation: 668.164

Completion Information

Water Level At Completion (bgl):	Date: 11/30/90
Screened Interval: 13.77-23.77	Filter Pack Interval: 11.8-24.2
Screen Length: 10	Bentonite Seal Interval: 8.3-11.8
End Cap Length: 0.15	Grout Interval: 0.4-8.3
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 13.5	Protective Casing Type: Flush Mount
Top of Casing Elevation: 667.933	Protective Casing Length/AG: 1/0.00

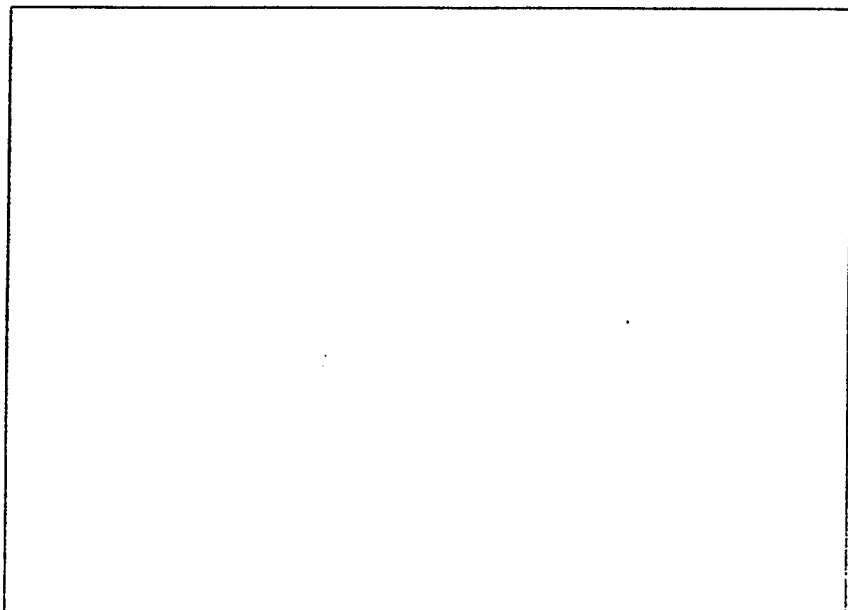
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/30/90	0900	1830	0	24.2

Abbreviations

Abbr.	Meaning
3xSS	3" x 2' Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch



Fort Sheridan RI/FS

Log of Well B208 MW03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Asphalt	FM			Drilled through asphalt.
16		1.5'	Sand-Gravel Mixture; 40% fine-coarse sand, 50% small-medium gravel (subrounded-angular), 10% silt and clay, yellowish brown (10YR 5/8), nonplastic, loose-medium, dry, dense, Asphalt Base.	GW			Hydrocarbon odor in soils immediately below asphalt - 10ppm OVM reading; fairly strong gasoline odor. 3"x2" SS @ 0'-2' - 40ppm OVM at 2' end of split spoon sample.
5			Silty Clay; 25% silt, 5% fine-medium sand, very dark gray (10YR 3/1), some discolorization to black, medium plasticity, soft, dry-slightly moist, Hydrocarbon Odor.	CL			Drilling down to 2 feet. 0 ppm OVM in B. zone 2 ppm
5			Silty Clay; 20-25% silt, 5% fine-medium sand, very dark gray (10YR 3/1), medium plasticity, soft, dry-slightly moist, Hydrocarbon Odor - Gradational contact w/ 3'-4" description	CL			3"x2" SS @ 2'-4' OVM reading of 10.1 ppm @ 2'-3' in sample 2.1 ppm at 3'-4'. Drilled down to 4 feet Difficulty pulling center bit out of augers OVM readings of greater than 200 ppm inside top of auger; 0-2.1 ppm breathing zone.
6		2.0'	Clay; w/silt 10%, 5% fine-med sand, mottled light gray (primary) (10YR 7/1) and dark yellowish brown (10YR 4/6), low plasticity, stiff, dry, v. slight Hydrocarbon Odor.	CL			3"x2" SS @ 4-6 feet High PID readings in BZ will continuously monitor while drilling to 6 foot Drilling to 6 feet Drilling to 6 feet - v. hard drilling
14			Silty Clay; 20-25% silt, 5% fine-medium sand, <5% small gravel, dark yellowish brown (10YR 4/6), low plasticity, v. stiff-hard, dry, Clay Till.	CL			collected 6'-8" SS (3"x2") Drilled to 8 feet
19			Silty Clay; 20-25% silt, 5% fine-coarse sand, 5% small-large gravel, dark yellowish brown (10YR 4/6), low plasticity, hard, dry, Clay Till. No Odors 0 ppm - PID	CL			
4			Silty Clay; 20-25% silt, 5% fine-coarse sand, 5% small-large gravel, dark yellowish brown (10YR 4/6), low plasticity, hard, dry, Clay Till. No Odors	CL			3"x2" split spoon @ 8'-10' Drilled down to 10 feet
16		2.0'	Clay; w/silt 15%, 5% fine-coarse sand, 5% small-medium gravel, dark grayish brown (10YR 3/2), low plasticity, v. stiff-hard, dry, Clay Till. No Odors	CL			3"x2" SS @ 10'-12' Drilled down to 12 feet
23			Clay; w/silt 10-15%, 5% fine-coarse sand, 5% small-medium gravel, dark grayish brown (10YR 3/2), low-medium plasticity, v. stiff-stiff, dry-slightly moist, Clay Till. No Odors	CL			3"x2" SS 12'-14' Drilled down to 14 feet
30			Silty Clay; 25-30% silt, 5% fine-coarse sand, <5% small gravel, gray (10YR 5/1), medium-high plasticity, medium stiff, dry-moist, a couple of saturated zones, Clay Till (?) or Lacustrine (?)	CLH			3"x2" SS @ 14'-16' Drilled down to 16 feet

Fort Sheridan RI/FS

Log of Well B208 MW03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
5							
12	2.0'			SP			
16							
7			Clay: w/silt 15%, 5% fine-medium sand, <5% small-medium gravel, gray (10YR 5/1), medium-high plasticity, medium stiff, dry-moist, <u>Clay Till</u> (?) or <u>Lacustrine</u> (?)	SP			3"x2" SS @ 16'-18' Drilled down to 18 feet Cuttings are coming up somewhat saturated
13	2.0'						
16							
19							
6			Clay: w/silt 15%, 5% fine-medium sand, <5% small-medium gravel, gray (10YR 5/1), medium-high plasticity, medium stiff-stiff, dry, <u>Clay Till</u> (?) or <u>Lacustrine</u> (?)	SP			H ₂ O in borehole; wet spoon when removing 3"x2" spoon @ 18'-20' Drilled down to 20'
10	2.0'						
16							
20							
25			Clay: w/silt 15-20%, 5% fine-coarse sand, 5% small-large gravel, dark gray (10YR 4/1), medium plasticity, stiff, dry, <u>Clay Till</u>	CL			3"x2" SS @ 20'-22' Spoon not wet on exterior Drilled down to 22'
6							
12	2.0'						
18							
18							
6			Clay: w/silt 15%, 5% fine-coarse sand, 5% small-large gravel, dark gray (10YR 4/1), medium plasticity, stiff-v. stiff, dry, <u>Clay Till</u>	CL			3"x2" SS @ 22'-24' Drilled down to 24'
13	2.0'						
16							
23							
6			Clay: w/silt 15%, 5% fine-coarse sand, <5% small-medium gravel, dark gray (10YR 4/1), medium plasticity, stiff-v. stiff, dry, <u>Clay Till</u>	CL			3"x2" SS @ 24'-26'
13	2.0'						
17							
21							
25							
30							Will set well 13.5' casing 10' screen 0.15' bottom cap Lowered well into augers Adding 1 st bag of sand Adding 2 nd bag of sand Adding 3 rd bag of sand Adding 4 th bag of sand Adding 5 th bag of sand measured down to sand 11.8' BGL Adding bentonite hole plug through the augers Bentonite Hole plug to 8.3' BGL Begin mixing grout 30 Gallons H ₂ O 4 Bags 94 lb portland 25 lbs bentonite powder Used all grout approximately 60 Gallons

Log of Well B208 MWO4

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3"x2' Split spoon sampler

Date Started: 12/11/90 Date Completed: 12/11/90

Total Depth Drilled: 16.44

Water Level While Drilling (bgl):

Ground Elevation: 669.232

Completion Information

Water Level At Completion (bgl):	Date: 12/11/90
Screened Interval: 11.07-16.07	Filter Pack Interval: 8.50-16.44
Screen Length: 5	Bentonite Seal Interval: 5.00-8.50
End Cap Length: 0.35	Grout Interval: 0.8-5.00
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval:
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height:
Total Casing: 10.5	Protective Casing Type: Flush Mount
Top of Casing Elevation: 668.705	Protective Casing Length/AG: 12/0.00

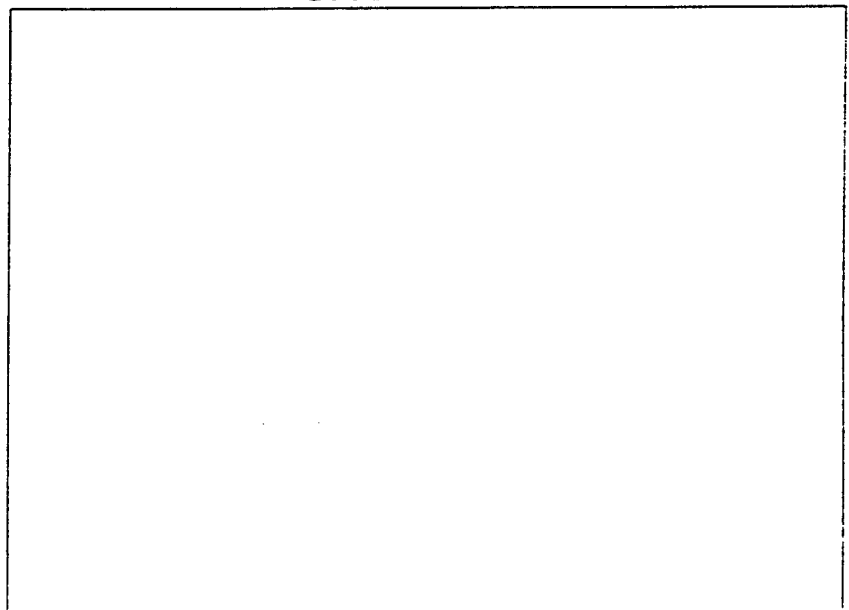
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
12/11/90	1020	1755	0	16

Abbreviations

Abbr.	Meaning
3xSS	3" x 2' Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch




Fort Sheridan RI/FS

Log of Well B208 MW04

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Asphalt	FM			12/11/90 Drilled through Asphalt 3"x2" @ 0'-2'
14	1.0'		Sand-Gravel Mixture; 40% fine-coarse sand, 5% small-medium gravel (subrounded-subangular), 10% silt and clay, yellowish brown (10YR 5/8), nonplastic, loose, dry, <u>Asphalt Base</u> , PID=27.8 ppm in open sample v. strong hydrocarbon fuel odor.	GW			Drilled down to 2 feet Strong odors; PID = 0.0 ppm in 3Z behind rig.
6							
6			Clay: w/silt 15-25%, 5% fine-medium sand, yellowish brown (10YR 5/4), low plasticity, stiff-v. stiff, dry, strong hydrocarbon fuel odor; PID=20.8 ppm	CL			3"x2" SS @ 2'-4' Drilled down to 4 feet
10	2.0'						
17							
21			Silty Clay: 20-25% silt, 5% fine-medium sand, <5% small-medium gravel, yellowish brown (10YR 5/6), low plasticity, v. stiff-hard, dry, <u>Clay Till</u> (?) Strong hydrocarbon odor PID = 27.8 ppm - open samples	CL			3"x2" SS @ 4'-6' Drilled down to 6 feet
6							
20	2.0'						
27							
34			Silty Clay: 20-25% silt, 5% fine-coarse sand, 5% small-medium gravel, dark yellowish brown (10YR 4/4), low plasticity, hard, dry, <u>Clay Till</u> , v. slight fuel odor, 0 ppm=PID	CL			3"x2" SS @ 6'-8' Drilled down to 8 feet v. hard drilling
14	2.0'						
20							
28							
35			Silty Clay: 25% silt, 5% fine-coarse sand, 5% small-large gravel, one cobble @ 9" in spoon (limestone composition), dark yellowish brown (10YR 4/6), low plasticity, hard, dry, gravel is angular-subangular, <u>Clay Till</u>	CL			3"x2" SS @ 8'-10' Drilling down to 10 feet v. hard drilling
16	2.0'						
24							
41							
43			Clay: w/silt 15% sand (FC) 10%-15%, 5% small-large gravel, dark yellowish brown (10YR 4/4), some gray mottled areas, low plasticity, hard, dry, one saturated zone at 16.8' approximately 1/2" of sandy clay, <u>Clay Till</u>	CL			3"x2" @ 10'-12' Drilling down to 12 feet v. hard drilling
9	2.0'						
26							
34							
41							
43			Silty Clay: 25% silt, 10% fine-coarse sand, 5% small-medium gravel, dark grayish brown (10YR 4/2), low plasticity, hard, dry, <u>Clay Till</u> ; Oppm PID	CL			3"x2" SS @ 14'-16' Drilled down to 16.44' (measured w/tape)
13	2.0'						
23							
26			Sand: fine-coarse (angular-subangular), 5% silt, 5% clay, 5% small gravel, light olive brown (2.5YR 5/3), nonplastic, medium dense-dense, angular-subangular, saturated. Oppm PID	SW			
22							

Fort Sheridan RI/FS

Log of Well

Depth (feet bgl)	Blow Counts Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Co
15						3
20					<p>Screen 5.0'</p> <p>Bottom Cap = 0.35' > 5.35'</p> <p>Casing = 10.5'</p> <p>Begin adding 1st bag of sand (1st bag only 1/2 full to begin with)</p> <p>Adding 2nd bag of sand</p> <p>Added total of 3 bags</p> <p>Sandpack to 8.5' BGL</p> <p>Added 2 Bags of Bentonite hole plug - measured to 5 feet BGL</p> <p>Mixing grout</p> <p>3 bags 94 lb Portland type II</p> <p>21 Gallons of H₂O</p> <p>15 lbs of Bentonite</p> <p>added grout to approximately 0.8' BGL</p> <p>Cut 2'x2' asphalt square</p> <p>Installed flush mount.</p>	
25						
30						

Log of Well B208SB5/MW5

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Pete Suell, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 7/14/91 Date Completed: 7/14/91

Total Depth Drilled: 24

Water Level While Drilling (bgl): 4

Ground Elevation: 669.1760

Completion Information

Water Level At Completion (bgl): 3	Date: 7/16/91
Screened Interval: 13.57-23.59	Filter Pack Interval: 9.7-23.9
Screen Length: 10.02	Bentonite Seal Interval: 6.5-9.7
End Cap Length: 0.31	Grout Interval: 0.7-6.5
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: NA
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: NA
Total Casing: 13.07	Protective Casing Type: flush mount
Top of Casing Elevation:	Protective Casing Length/AG: 1/0

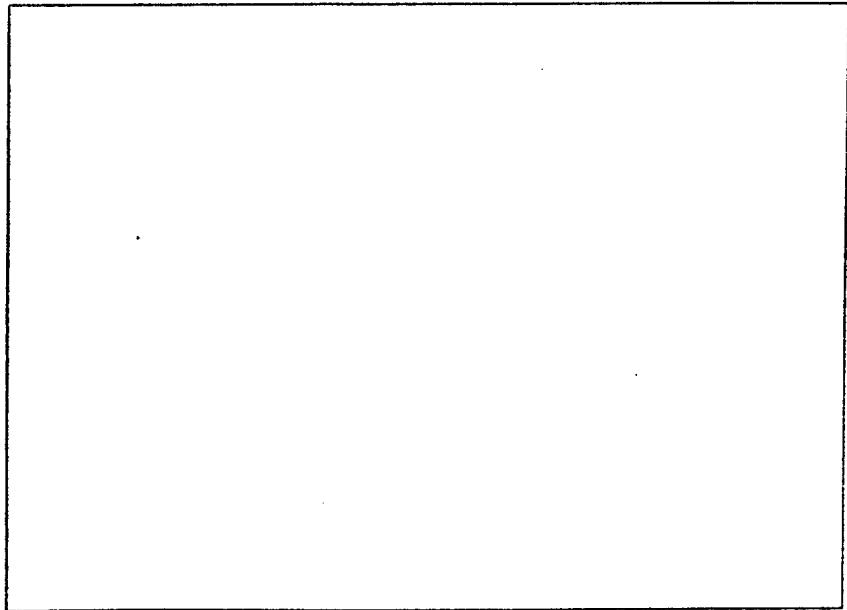
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/14/91	0934	1125	0	24

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	hollow stem augers
FM	fill material
some	25-35%
little	15-25%
few	5-10%
trace	<5%
PID	photoionization detector
ppm	parts per million



Fort Sheridan RI/FS

Log of Well B208SB5/MW5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Asphalt:	FM			Sample from 0.15 to 4 feet was obtained at 0935 hours.
		Crushed Stone and Sand: some fines (silt and clay), yellow brown (10YR5/6), non-plastic, moist	FM			Headspace screening of the sample with a PID was 0.0 ppm.
	2	Clay: some silt, little gravel, brown (10YR5/3) with some grey (10YR5/1), low plasticity, moist, coarse sand was observed in the tip of the sampling spoon	CL			Munsell color chart notations are referenced in each description.
5		Clay: some silt, little gravel, brown (10YR5/3) with few grey (10YR5/1), low plasticity, dry to slightly moist	CL			Sample from 4 to 9 feet was obtained at 0950 hours.
	5		CL			Headspace screening of the sample with a PID was 0.0 ppm.
10		Clay: some silt, little gravel, brown (10YR5/3), low plasticity, dry to slightly moist	CL			Sample from 9 to 14 feet was obtained at 1000 hours.
	3.5		CL			Headspace screening of the sample with a PID was 0.0 ppm.
		Clayey Sand: some gravel, brown (10YR5/3), low to no plasticity, saturated	SC			
	5	Silt: little clay, few sand and gravel, grey (10YR5/1), low to no plasticity, very moist	ML			Sample from 14 to 19 feet was obtained at 1020 hours.
15		Clay: some silt, little gravel, dark grey (10YR4/1), low plasticity, slightly moist	CL			Headspace screening of the sample with a PID was 0.0 ppm.

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Log of Well B208SB5/MW5

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS	Lithologic	Well Construction	Comments
			Classification	Log		
15						
5			CL			
20		Clay: some silt, little gravel, trace sand, dark grey (10YR4/1), low plasticity, slightly moist	CL		Sand Pack	Sample from 19 to 24 feet was obtained at 1035 hours.
5						
25						
30						

Log of Well B208SB6/MW6

Fort Sheridan RI/FS

Contract Number D44415-90-D-0017

Driller & Company: Pete Suell, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 7/13/91 Date Completed: 7/13/91

Total Depth Drilled: 24.2

Water Level While Drilling (bgl): Dry

Ground Elevation: 667.8543

Completion Information

Water Level At Completion (bgl): Dry	Date: 7/13/91
Screened Interval: 13.64-23.84	Filter Pack Interval: 9.8-24.2
Screen Length: 10.0	Bentonite Seal Interval: 4.8-9.3
End Cap Length: 0.36	Grout Interval: 0.7-4.8
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: NA
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: NA
Total Casing: 13.38	Protective Casing Type: flush mount
Top of Casing Elevation:	Protective Casing Length/AG: 1/0

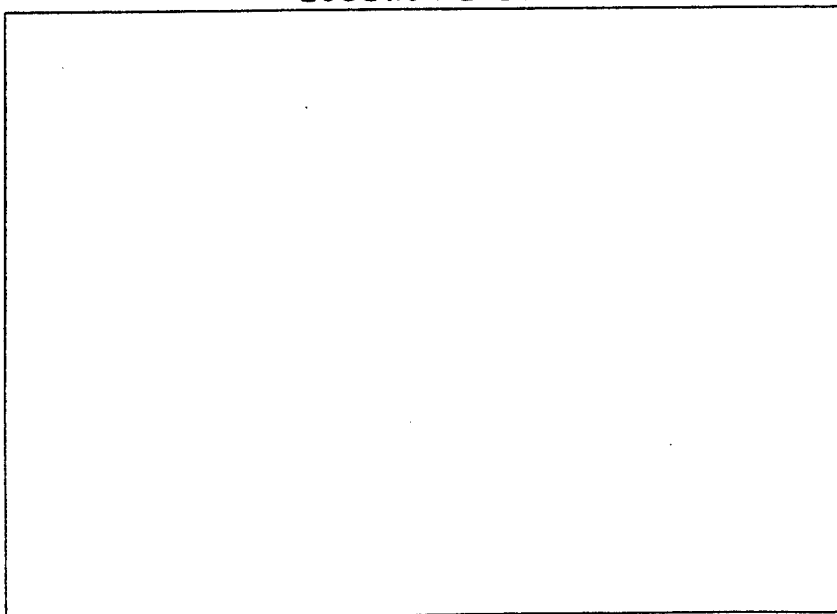
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/13/91	1407	1520	0	24

Abbreviations

Abbr.	Meaning
HSA	hollow stem augers
FM	fill material
some	25-35%
little	15-25%
few	5-10%
trace	<5%
PID	photoionization detector
ppm	parts per million

Location Sketch



Fort Sheridan RI/FS

Log of Well B208SB6/MW6

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Asphalt:	FM			No sample was obtained from 0 to 1.5 feet due to the presence of concrete.
		Concrete:	FM			
2.5		Clay: some silt, little small to medium gravel, trace sand, brown (10YR5/3) with grey (10YR5/1), low plasticity, slightly moist	CL		Cement Grout	Sample from 1.5 to 4 feet was obtained at 1415 hours. Headspace screening of the sample with a PID was 0.0 ppm. Munsell color chart notations are referenced in each description.
5		Clay: some silt, little small gravel, few sand, brown (10YR5/3) with few grey (10YR5/1), low plasticity, slightly moist	CL		Bentonite Hole Plug	Sample from 4 to 9 feet was obtained at 1425 hours. Headspace screening of the sample with a PID was 0.0 ppm.
10		Clay: some silt, little small gravel, trace sand, brown (10YR5/3), low plasticity, slightly moist to dry, some areas appear to be a clayey silt	CL		Sand Pack	Sample from 9 to 14 feet was obtained at 1435 hours. Headspace screening of the sample with a PID was 0.0 ppm.
15		Clay: some silt, little small gravel, trace sand, grey (10YR4/1), low plasticity, moist	CL			Sample from 14 to 19 feet was obtained at 1445 hours. Headspace screening of the sample with a PID was 0.0 ppm.

Fort Sheridan RI/FS

Log of Well B208SB6/MW6

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
5			CL			
20		Clay, some silt, little small to medium gravel, trace sand, grey (IC:R2/1), low plasticity, moist	CL		Sand Pack	Sample from 19 to 24 feet was obtained at 1500 hours. Headspace screening of the sample with a PID was 0.0 ppm.
25						
30						

Log of Well B208SB7/MW7

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Driller & Company: Pete Bueh, ESE, Inc.

Geologist/Logger & Company: Michael Poznaniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 7/13/91 Date Completed: 7/13/91

Total Depth Drilled: 24.2

Water Level While Drilling (bgl): Dry

Ground Elevation: 668.376C

Completion Information

Water Level At Completion (bgl): Dry	Date: 7/13/91
Screened Interval: 13.73-23.72	Filter Pack Interval: 9.6-24.2
Screen Length: 9.99	Bentonite Seal Interval: 5.0-9.6
End Cap Length: 0.31	Grout Interval: 0.9-5.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: NA
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: NA
Total Casing: 13.03	Protective Casing Type: flush mount
Top of Casing Elevation:	Protective Casing Length/AG: 1/0

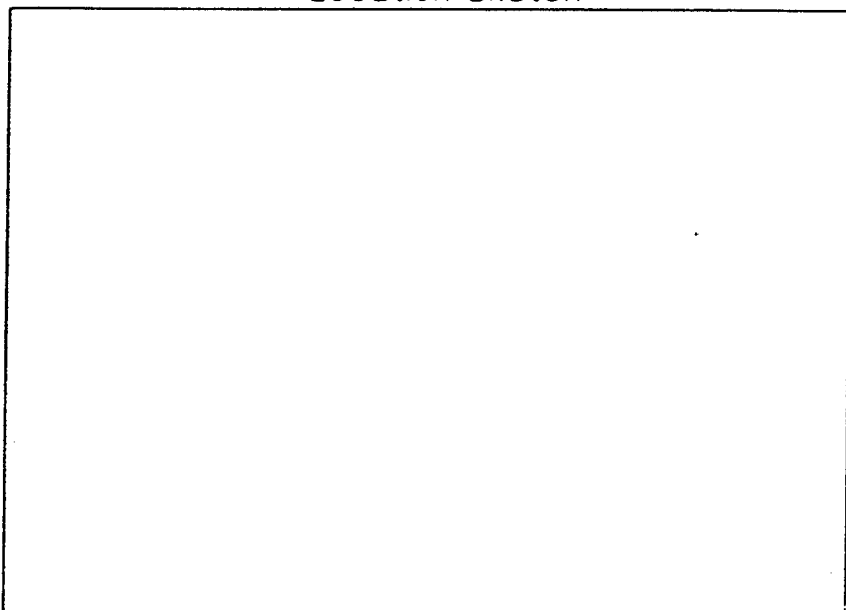
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/13/91	0911	1010	0	24

Abbreviations

Abbr.	Meaning
HSA	hollow stem augers
FM	fill material
some	25-35%
little	15-25%
few	5-10%
trace	<5%
PID	photoionization detector
ppm	parts per million

Location Sketch



Fort Sheridan RI/FS

Log of Well B208SB7/MW7

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Asphalt:	TM			No sample was obtained from 0 to 1.5 feet due to the presence of concrete.
		Concrete:	TM			
2.5		Sand and Gravel: some fines (silt and clay), dark yellowish brown (10YR4/2), non-plastic, moist	TM			Sample from 1.5 to 4 feet was obtained at 0915 hours. Headspace screening of the sample with a PID was 0.0 ppm. Munsell color chart notations are referenced in each description.
		Clay: some silt, little small gravel, trace sand, yellowish brown (10YR5/3) with little grey (10YR5/1), low plasticity, slightly moist to dry	CL			
5		Clay: some silt, little small to medium gravel, trace sand, brown (10YR5/3) with little grey (10YR5/1), low plasticity, slightly moist to dry	CL			Sample from 4 to 9 feet was obtained at 0925 hours. Headspace screening of the sample with a PID was 0.0 ppm.
10		Clay: some silt, little small to medium gravel, trace sand, brown (10YR5/3), low plasticity, slightly moist	CL			Sample from 9 to 14 feet was obtained at 0935 hours. Headspace screening of the sample with a PID was 0.0 ppm.
15		Clay: some silt, little small to medium gravel, trace sand, dark grey (10YR4/1), low plasticity, slightly moist	CL			
		Clay: some silt, little small to medium gravel, dark grey (10YR4/1) with some brown (10YR5/3), low plasticity, slightly moist to moist, brown areas are crumbly	CL			Sample from 14 to 19 feet was obtained at 0950 hours. Headspace screening of the sample with a PID was 0.0 ppm.

Fort Sheridan RI/FS

Log of Well B208SB7/MW7

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS	Lithologic	Well Construction	Comments
			Classification	Log		
15						
5			CL			
20		Clay: some silt, little small to medium gravel, few sand, dark grey (10YR4/1), low plasticity, moist	CL			Sample from 19 to 24 feet was obtained at 1000 hours. Headspace screening of the sample with a PID was 0.0 ppm.
5						
25						
30						

Log of Well B208SB8/MW8

Fort Sheridan RI/FS

Contract Number D-AAA:5-90-D-0017

Driller & Company: Pete Suell, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat 1 Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 7/15/91 Date Completed: 7/15/91 Total Depth Drilled: 24.15

Water Level While Drilling (bgl): 4 Ground Elevation: 668.6203

Completion Information

Water Level At Completion (bgl): Dry	Date: 7/15/91
Screened Interval: 13.79-23.79'	Filter Pack Interval: 9.7-24.15
Screen Length: 10.0	Bentonite Seal Interval: 5.4-9.7
End Cap Length: 0.36	Grout Interval: 0.7-5.4
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: NA
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: NA
Total Casing: 13.25	Protective Casing Type: flush mount
Top of Casing Elevation:	Protective Casing Length/AG: 1/0

Drilling Shifts

Date	Start	Time	End	Depth of Drilling Per Shift
				Start End
7/15/91	0921		1115	0 24

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	hollow stem augers
FM	fill material
some	25-35%
little	15-25%
few	5-10%
trace	<5%
PID	photoionization
	detector
ppm	parts per million

Fort Sheridan RI/FS

Log of Well B208SB8/MW8

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Asphalt:	FM			No sample was obtained from 0 to 1.5 feet due to the presence of the asphalt and crushed stone.
		Crushed stone and Sand: little silt, black (10YR2/1), non-plastic, moist, <u>Fill Material</u>	FM			
2.5		Silt: grey (10YR5/1) with some black (10YR2/1) areas, moist, <u>Fill Material</u>	FM			Sample from 1.5 to 4 feet was obtained at 0940 hours. Headspace screening of the sample with a PID was 0.0 ppm. Munse# color chart notations are referenced in each description.
		Clay: some silt, little gravel, trace sand, brown (10YR5/3) with little grey (10YR5/1), low plasticity, moist	CL			
5		Sandy Clay: little silt and gravel, brown (10YR5/3) with little grey (10YR5/1), low plasticity, saturated	CL			Sample from 4 to 9 feet was obtained at 0950 hours. Headspace screening of the sample with a PID was 0.0 ppm.
		Clay: some silt, little small gravel, brown (10YR5/3) with grey (10YR5/1), low plasticity, slightly moist	CL			
10		Clay: some silt, little small gravel, trace sand, brown (10YR5/3), low plasticity, slightly moist	CL			Sample from 9 to 14 feet was obtained at 1000 hours. Headspace screening of the sample with a PID was 0.0 ppm.
		Clay: some silt, little gravel, brown (10YR5/3) and grey (10YR5/1), low plasticity, slightly moist	CL			
		Clay: some silt, little gravel, dark grey (10YR4/1), low plasticity, slightly moist	CL			
15		Clay: some silt, little small to large gravel, trace sand, dark grey (10YR4/1), low plasticity, moist	CL			Sample from 14 to 19 feet was obtained at 1015 hours. Headspace screening of the sample with a PID was 0.0 ppm.

Fort Sheridan RI/FS

Log of Well B208SB8/MW8

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15						
	5		CL			
20		Clay; some silt, fine sand gravel, dark grey (10YR4/1), low plasticity, moist	CL			Sample from 19 to 24 feet was obtained at 1025 hours. Headspace screening of the sample with a PID was 0.0 ppm.
	5					
25						
30						

Log of Boring B377SB01

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Chuck Vermillion, Don Maki, ESE, Inc.

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Drilling Rig: CME 55 Truck Mounted Rig Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2' Split Spoon

Date Started: 1/21/91 Date Completed: 1/22/91 Total Depth Drilled: 24

Water Level While Drilling (bgl): DRY Ground Elevation: 667.264

Completion Information

Water Level At Completion (bgl): DRY Date: 1/22/91

Grout Interval: 0-2'

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/21/91	1103	1703	0	24
1/22/91	1015	1230	--	--

Abbreviations

Location Sketch

Abbr. Meaning

HSA hollow stem auger

trace = < 5%

few = 5-10%











little = 15-25%

some = 30-45%

mostly = 50-100%

Fort Sheridan RI/FS

Log of Boring B377SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Gravel: some sand, light grey (10YR7/1) to very dark grey (10YR2/1), nonplastic, loose, moist, subrounded, gravel fill, frozen.	GP			Frozen soil and gravel could not drive spoon, begin first sample at 1-3'.
11		0.8	Clay: trace silt and fine gravel, dark brown (10YR4/3) with mottles yellowish brown (10YR5/8) and black (10YR2/2), low plasticity, hard, no apparent bedding, <u>Glacial Till</u>	CL			Collected SS1 1-3 ft. Hard drilling. Munsell color chart is referenced in the descriptions.
14							
19							
31				NL			
18		2.0	Clay: trace silt and fine gravel, dark brown (10YR4/3) with mottles yellowish red (10YR5/8) and grey (10YR6/1), medium plasticity, hard, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			Collected SS2. Very difficult drilling.
33							
50							
52		2.0	Clay: trace silt and fine gravel, dark brown (10YR4/3) with mottles yellowish red (10YR5/8) and grey (10YR6/1), medium plasticity, hard, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			Collected SS3.
16							
35							
47		2.0	Clay: trace silt and fine gravel, dark brown (10YR4/3) changing to dark grey (10YR4/1) at 9 feet below ground level, medium plasticity, hard, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			Collected SS4. Continued hard drilling.
70							
25							
33		2.0	Clay: trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, hard to firm at 12 ft., moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			Collected SS5. Hard drilling. Slight wetness on outside of sample. Center of sample only moist, not wet.
43							
11							
18		2.0	Clay: trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			Collected SS6. Wet on outside of sample but moist (no free water) in center.
30							
47							
13		2.0	Clay: trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			Collected SS7. Wet on outside of sample but moist (no free water) in center.
19							
27							
23		2.0	Clay: trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			
7							
15							

Fort Sheridan RI/FS

Log of Boring B377SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15							
20	2.0			CL			
25							Collected SS8. Wet on outside of sample but moist (no free water) in center.
9			Clay; trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			
15	2.0						
22							
24							Collected SS9. Wetness on outside of sample but only moist in center (no free water).
10			Clay; trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			
15	2.0						
15							
20							
21							Collected SS10. Wetness on outside of sample but only moist in center (no free water). Turned up fist sized rock (dolomite).
7			Clay; trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			
17	2.0						
23							
29							Collected SS11. Wetness on outside of sample but only moist in center (no free water).
ROD WT.			Clay; trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			
14	2.0						
14							
14							
26			Clay; trace silt and fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>	CL			Collected SS12. Total depth of drill 24 feet.
25							
17	2.0			CL			
13							
18							
							1/22/91 Grouted borehole to surface: 10 bags Portland 70 gallons water 1/2 bag of bentonite gel.
30							

Log of Test Pit B377TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/19/91

Date Completed: 02/19/91

Total Depth of Trench: 14.5

Ground Elevation: 668.203

Water Level While Trenching (bgl): 1.3

Trenching Shifts

Date	Time		Depth of Trenching Per Shift:	
	Start	End	Start	End
02/19/91	1000	1340	0	14.5






Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
w/	with

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B377TP1

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Fill Material: concrete and fill material	FM		
	Silty Clay: 5 to 10% silt, low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		mottled gray and brown water at concrete/clay interface (1.3 feet)
	Silty Clay: 5 to 10% silt, brown (10YR 5/3), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		clay becomes solid brown
	Silty Clay: 5 to 10% silt, brown (10YR 5/3), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
	Silty Clay and Gravel: 5 to 10% silt, < 1% gravel, gray (10YR 5/1), low plasticity, hard, moist, massive, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		transition to gray clay occurs at 13.0 feet.

Log of Test Pit B377TP2

Fort Sheridan RI/FS

Contract Number DAAA15-93-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/13/91

Date Completed: 02/19/91

Total Depth of Trench: 14.5

Ground Elevation: 668.808

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/19/91	1510	1700	0	14.5

Abbreviations




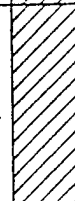
Location Sketch

Abbr. Meaning

med medium
w/ with

Fort Sheridan RI/FS

Log of Test Pit B377TP2

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Fill Material: concrete and fill material	FM		
	Silty Clay and Gravel: 5 to 10% silt, < 1% gravel, brown (10YR 5/3), low plasticity, hard, moist, massive, homogeneous, subrounded to subangular gravel, <u>Glacial Till</u> .	CL		
	Silty Clay: 5 to 10% silt, brown (10YR 5/3), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
	Silty Clay with Gravel: 5 to 10% silt, < 1% gravel, gray (10YR 5/1), med plasticity, hard, moist, massive, homogeneous, gravel is subrounded, <u>Glacial Till</u> .	CL		

Log of Test Pit B377TP3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Backhoe Operator & Company: Bob Bowman, ESE, Inc.	
Backhoe: Case 580K	
Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts	
Date Started: 02/25/91	Date Completed: 02/25/91
Total Depth of Trench: 14.5	Ground Elevation: 667.144
Water Level While Trenching (bgl):	

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/25/91	1510	1745	0	14.5

Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
w/	with

Location Sketch

Log of Test Pit B377TP3

B - 201

Log of Test Pit CSA4TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 583K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/05/91

Date Completed: 02/05/91

Total Depth of Trench: 12.0

Ground Elevation: 657.761

Water Level While Trenching •(bgl): 12.0

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/05/91	1420	1730	0	12.0

Abbreviations

Abbr.	Meaning
med	medium
dk	dark
n.a.b.	no apparent bedding
BGL	Below Ground Level
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit CSA4TP1

Depth (feet bgl)	Soil Description	USCS	Lithologic Log	Comments
		Classification		
0	Clay: some sand and gravel, roots, very dark gray (10YR 3/1), striations of coal at 0.7 feet BGL, black in color (7.5YR 2/0), changes to dk gray (10YR 4/1) at 0.7 feet and lower to 1.9 feet BGL. 1.9 feet and lower: yellowish brown (10YR 5/4), with mottles of dk brown (7.5YR 4/4), frost to 0.5 feet BGL, low plasticity throughout, firm to hard, moist, n.a.b., <u>Topsol/Glacial Till</u>	CL		sample collected at 0.3 feet BGL in coal striation
5	Clay: trace fine to med gravel, brown (10YR 5/3) with mottles of gray (10YR 6/1); starting at 5.0 feet BGL, strong brown mottles (7.5YR 4/6); low plasticity, moist, firm to hard, n.a.b., <u>Glacial Till</u>	CL		
10	Clay: trace fine gravel, brown (10YR 5/3), with few black mottles (7.5YR 2/0) at 10 feet BGL, changing to dk gray (10YR 4/1) at 11 feet BGL, low plasticity, hard, moist, n.a.b., <u>Glacial Till</u>	CL		sample collected at 7.5 feet BGL -sample collected at 12.0 feet BGL -water observed in bottom of hole at 12 feet BGL -backfilled hole to surface with soil thus removed -offsite 5.450m
15				

Log of Test Pit CSA4TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/04/91

Date Completed: 02/04/91

Total Depth of Trench: 12.0

Ground Elevation: 697.895

Water Level While Trenching (bgl): 12.0

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/04/91	1210	1745	0	12.0

Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
dk	dark
n.a.b.	no apparent bedding
ft	feet
esp.	especially
BGL	Below Ground Level
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit CSA4TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Clay: some sand and gravel, frozen, black (10YR 2/1), low plasticity, consistency firm, moist, n.a.b., <u>Topsoil</u>	CL		collected soil sample at 1.5 feet
	Clay: few silt, brown (10YR 5/3) with some black mottles (10YR 2/1), low plasticity, firm, moist, n.a.b.	CL		
	Clay: trace silt, dark yellowish brown (10YR 4/4) with red mottles (2.5YR 4/6) and black mottles (10YR 2/1).	CL		
	Clay: trace silt, brown (10YR 5/3) with gray mottles (10YR 6/1), few yellow brown mottles (10YR 5/8).	CL		
5	Clay: trace silt, brown (10YR 5/3) with gray mottles (10YR 6/1), low plasticity, firm, moist, n.a.b., <u>Glacial Till</u>	CL		collected soil sample at 7.5 feet
10	Clay: trace silt, grayish brown (10YR 5/2), gray mottling (10YR 6/1), esp. along root channels; low plasticity, firm, moist, color changes to dark gray (10YR 4/1) at 11 ft BGL, <u>Glacial Till</u> water in bottom of hole at 12 feet BGL.	CL		-collect sample at 12.0 feet BGL -backfilled hole with soil excavated after collecting 12 foot sample
15				

GEA 5

Log of Well B125 MW02

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: James S. Guentert, ESE, Inc.	
Drilling Rig: CME-55	Drilling Method: 4 1/4" ID HSA
Soil Sampling Device: Laskey Continuous Sampler	
Date Started: 11/13/90	Date Completed: 11/13/90
Total Depth Drilled: 10.	
Water Level While Drilling (bgl):	Ground Elevation: 682.924

Completion Information

Water Level At Completion (bgl): 2.12	Date: 11/13/90
Screened Interval: 2.00-7.00	Filter Pack Interval: 1.1-8
Screen Length: 5	Bentonite Seal Interval: 0.60-1.5
End Cap Length: 0.20	Grout Interval: 0-0.60
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 5.45	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 685.303	Protective Casing Length/AG: 5/3.70

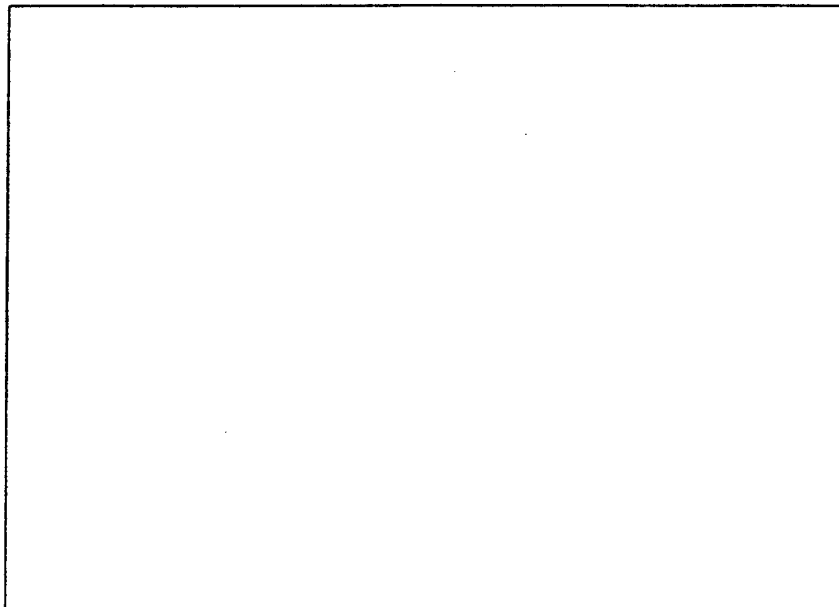
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/13/90	1140	1545	0	10

Abbreviations


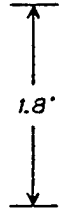
Abbr.	Meaning
3xSS	3" x 2' Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch



Fort Sheridan RI/FS

Log of Well B125 MW02

Depth (feet bgl)	Blow Counts Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Sandy Clay: 30% fine sand, 5% silt, organic rich, dark brown (7.5YR 3/2), non-plastic, v. soft, dry, <u>Top Soil</u> .	OL			<p>11/13/90 Pushed it from 0'-5' w/drill hard Drilling down to 5 feet Water in borehole to 2 feet BGL Water seems to be coming in from discrete thin zones. The highest @ 2-2.5 feet- below ground level, corresponding to fill zone; this lowest at 3.5 - 4 feet BGL. Pulled augers out, after drilling to 5 feet, "popping" out plug Drilling down, preparing to insert sampler.</p>
4.6		Silty Clay: 25% silt, 5% fine sand, dark yellowish brown (10YR 4/6), medium plasticity, soft-medium stiff, <u>moist-sat</u> @ 3.0 feet. <u>Fill material</u> .	CL			
5		Sandy Clay: 25% F. sand, 5% silt, 5% F.-med gravel, mottled dark yellowish brown (10YR 4/7) and gray (10YR 5/1), medium-high plasticity, medium stiff, <u>moist-dry</u> , <u>Clay Till</u> (?)	CL			
10		Silty Clay: 25% silt, 10% F-M sand, dark yellowish brown (10YR 4/4) mottled w/gray (10YR 5/1), low plasticity, stiff, no apparent bedding, <u>Clay Till</u> . Limited samples per description.	CL			Difficulty inserting sampler. Drilling down to 10 feet w/ continuous corer Only 1 foot of accumulation in spoon, mixtures of cuttings; water
8		Silty Clay: 20-25% silt, 10% F-C sand, <5% fine-med gravel, dark yellowish brown (10YR 4/4), low plasticity, v. stiff-hard, dry, no discernable bedding, <u>Clay Till</u> .	CL			Will drive 3"x2 foot spoon from 10'-12'
19						
27						
48						<p>Tripping 4 1/4" ID HSA out of hole. Will install well open hole. Measured bottom of hole 8.9 feet - some collapse @ bottom of borehole. Installed well Bottom of well 7.20' Bottom of screen 7.00' Top of screen 2 feet Sandpack to 1.5' Bentonite hole plug to 0.6' Then hydrated hole plug. Pushed procover (6x6) into place Cement bentonite grout 0.6 surface.</p>
15						

Log of Boring B125SB03

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 11/14/90 Date Completed: 11/14/90

Total Depth Drilled: 8

Water Level While Drilling (bgl):

Ground Elevation: 682.040

Completion Information

Water Level At Completion (bgl):

Date: 11/14/90

Grout Interval: 0-8

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/14/90.	0900	1030	0	8










Abbreviations

Location Sketch

Abbr.	Meaning
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Fort Sheridan RI/FS

Log of Boring B125SB03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Concrete	CN		 Cement Grout	11/14/90
2			Disturbed Brown Fine Sand	FM			3"x2" SS @ 0'-2' skipped 0-1 because of concrete taken out and disturbance during the removal of concrete.
3		1.5	Clay: w/silt, 15-20%, and 10% fine sand, olive brown (2.5Y 4/4), medium plasticity, soft-medium stiff, dry, no bedding. Fill Material (?) 2" of black coaly material @ 1.5-1.65', with slight fuel odor in sample.	CL			Drilled Down to 3 feet Will attempt to push next spoon - concerned about fill material and unknown objects - see if we encounter natural material.
5			Silty Clay: 25% silt, 10% fine sand, mottled dark yellowish brown (10YR 4/6) and gray (10YR 5/1), low plasticity, medium stiff-stiff, dry (overall), moist-saturated 3.5-3.6', no bedding, but roots last 1 foot (4'-5'), -oxidation occurs throughout 4'-5' interval sand is angular-subangular.	CL			3"x2" SS @ 3'-4' Drilled down to 5 feet Harder drilling at 4 feet
8			Silty Clay: 25% silt, 15% fine sand, 5% med-coarse sand, yellowish brown (10YR 5/1) and gray (10YR 5/1), nonplastic-low plastic, v. stiff-Hard, dry, no bedding or fabric, sand is angular-subangular, Clay Till. Oxidation occurs throughout interval.	CL			3"x2" SS @ 5'-7' -Could not put centerbit in augers, because of bend. -Pulling augers out- Waited 5 minutes no H ₂ O in bore hole. Drilling down to 7' preparing to sample 7-9 foot interval.
11			Silty Clay: 25-30% silt, >5% fine sand, >5% coarse sand-fine gravel (angular), dark yellowish brown (10YR 3/6), nonplastic-low plasticity, hard, dry, no apparent bedding, gravel - angular Clay Till. No odors.	CL			3"x2" SS @ 7'-9' Pulling augers to see if any H ₂ O is coming in from shallow zone Drilling down to 8 feet. Will leave open to see if H ₂ O collects (1100) No water in borehole @ 1517 Mix cement/bentonite grout 30 gallons H ₂ O 25 lbs bentonite 5 bags portland type II Measured borehole 8 feet Bottom Filled w/cement grout to surface.
16		1.6					
25							
25							
32		2.0					
43							

Log of Well B125SB4/MW4

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 850 Track Mounted Rig	Drilling Method: 6 3/4" HSA
Soil Sampling Device: 2' x 3' Split Spoon	
Date Started: 7/27/91	Date Completed: 7/27/91
Total Depth Drilled: 8.9	
Water Level While Drilling (bgl): Dry	Ground Elevation: 683.4588

Completion Information

Water Level At Completion (bgl): Dry	Date: 7/27/91
Screened Interval: 2.77-7.76	Filter Pack Interval: 2.25-3.9
Screen Length: 4.99	Bentonite Seal Interval: 1.2-2.25
End Cap Length: 0.35	Grout Interval: 0-1.2
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 5.8	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 686.4593	Protective Casing Length/AG: 5.02/3.39

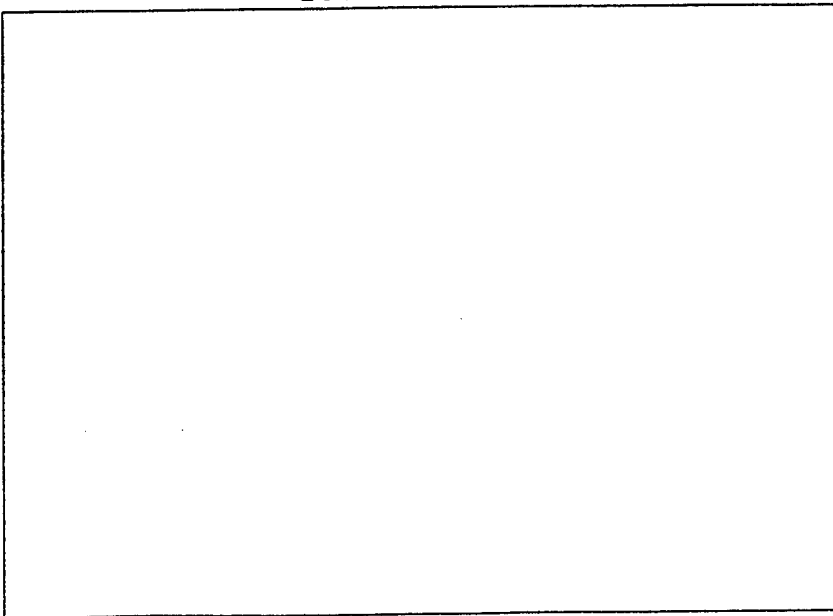
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/27/91	0826	0912	0	8.9

Abbreviations


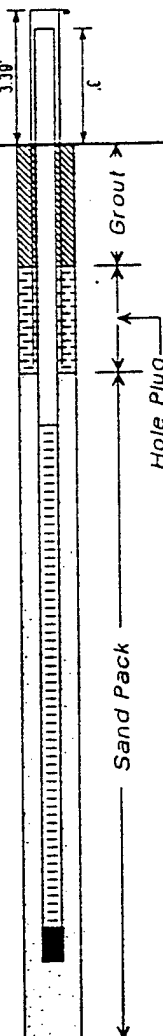





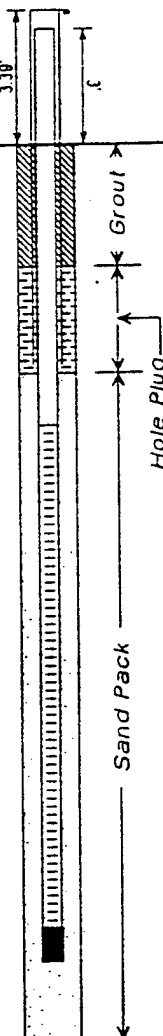

Abbr.	Meaning
HSA	Hollow Stem Augers
sched	schedule
FM	fill material
NL	not logged
some	25-35%
little	15-25%
few	5-10%
PID	photoionization detector
ppm	parts per million

Location Sketch



Fort Sheridan RI/FS

Log of Well B125SB4/MW4

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Clay: some silt, little gravel, brown (10YR5/3), low plasticity, hard, dry	CL			Sample from 0 to 2 feet was obtained at 0830 hours. Headspace screening of the sample with a PID was 0.0 ppm. Munsell color chart is referenced in each description.
4		1.7	Clay: some silt, wood, coal, very dark grey (10YR3/1), low plasticity, hard, dry. <u>Fill Material</u>	FM			
8			Crushed Stone and Sand: fine sand, <u>Fill Material</u>	FM			Sample from 2 to 4 feet was obtained at 0835 hours. Headspace screening of the sample with a PID was 0.0 ppm.
5		1.5	Clay: some silt, few small gravel, brown (10YR5/3), low plasticity, hard, dry	CL			
6			Clay: some silt, few small gravel, brown (10YR5/3) with grey (10YR5/1), hard, moist	CL			Sample from 4 to 6 feet was obtained at 0845 hours. Headspace screening of the sample with a PID was 0.0 ppm.
3		1.3	Clay: some silt, few small to medium gravel, brown (10YR5/3) with grey (10YR5/1), hard, dry to slightly moist	CL			
4			The interval from 8 to 8.9 was not sampled or logged.	NL			
5		2.0					Sample from 6 to 8 feet was obtained at 0900 hours. Headspace screening of the sample with a PID was 0.0 ppm.
8							
9							
14							
18							
10							
15							

Log of Well B125SB5/MW5

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Darryl Krause, Stearns Drilling	
Geologist/Logger & Company: Michael Pozniak, ESE, Inc.	
Drilling Rig: CME 850 Track Mounted Rig	Drilling Method: 6 3/4" HSA
Soil Sampling Device: 2' x 3' Split Spoon	
Date Started: 7/27/91	Date Completed: 7/27/91
Total Depth Drilled: 10	
Water Level While Drilling (bgl): Dry	Ground Elevation: 681.8757

Completion Information

Water Level At Completion (bgl): Dry	Date: 7/27/91
Screened Interval: 2.65-7.65	Filter Pack Interval: 2.35-10.0
Screen Length: 5.0	Bentonite Seal Interval: 1.0-2.35
End Cap Length: 0.35	Grout Interval: 0-1.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 5.72	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 684.9259	Protective Casing Length/AG: 5.02/3.26

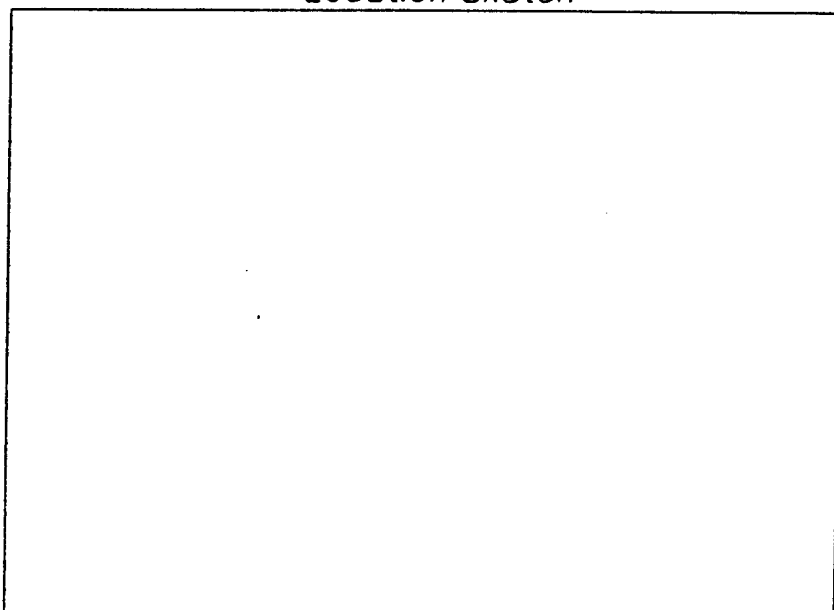
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/27/91	1058	1130	0	10.0

Abbreviations

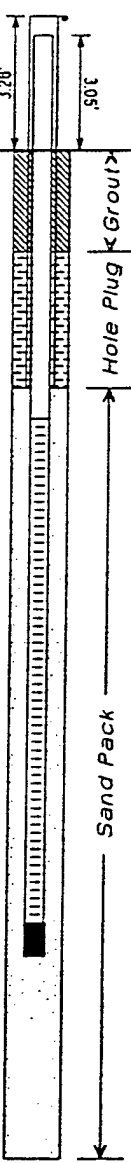
Location Sketch

Abbr.	Meaning
HSA	Hollow Stem Augers
sched	schedule
some	25-35%
little	15-25%
few	5-10%
PID	photoionization detector
ppm	parts per million



Fort Sheridan RI/FS

Log of Well B125SB5/MW5

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
							
0			Clay: some silt, few small gravel, vegetation, brown (10YR5/3), hard, dry				Sample from 0 to 2 feet was obtained at 1100 hours. Headspace screening of the sample with a PID was 0.0 ppm. Munsell color chart is referenced in each description.
3							
9	2.0			CL			
11							
11			Clay: some silt, few small to medium gravel, few sand brown (10YR5/3) with few grey (10YR4/1), hard, slightly moist				Sample from 2 to 4 feet was obtained at 1105 hours. Headspace screening of the sample with a PID was 0.0 ppm.
5	1.5			CL			
5							
8							
3			Clay: some silt, few small to medium gravel, brown (10YR5/3), hard, slightly moist				Sample from 4 to 6 feet was obtained at 1115 hours. Headspace screening of the sample with a PID was 0.0 ppm.
8	2.0			CL			
13							
18							
18			Clay: some silt, few small to medium gravel, brown (10YR5/3) with few grey (10YR4/1), hard, slightly moist				Sample from 6 to 8 feet was obtained at 1120 hours. Headspace screening of the sample with a PID was 0.0 ppm.
6	2.0			CL			
11							
14							
19							
19			Clay: some silt, few small to medium gravel, brown (10YR5/3) with little grey (10YR4/1), hard, slightly moist				Sample from 8 to 10 feet was obtained at 1130 hours. Headspace screening of the sample with a PID was 0.0 ppm.
5	2.0			CL			
7							
12							
15							
10							
15							

Log of Boring CSA1 SB01

Fort Sheridan RI/FS

Contract Number DAA415-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 12/12/90 Date Completed: 12/13/90

Total Depth Drilled: 23.9

Water Level While Drilling (bgl):

Ground Elevation: 678.063

Completion Information

Water Level At Completion (bgl):

Date: 11/13/90

Grout Interval: 0-23.9

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
12/12/90	1109	1800	0	24
12/13/90	0820	1100	20	24

Abbreviations

Location Sketch

Abbr.	Meaning
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level
BZ	Breathing Zone

Fort Sheridan RI/FS

Log of Boring CSA1 SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0							
4			Clay: w/silt (C-15%), fine-coarse sand (10%) and fine-medium gravel (10%), black (7.5YR N2/1), low-medium plasticity, medium stiff, dry, rootlets and grass around 0.5'. Top Soil.	CL			12/12/90 Collected 3"x2" SS @ 0'-2' Drilled Down to 2 feet
12		2.0					
23			Coal/Clay: 50%/50% mixture black (7.5YR N2/1) and brown (7.5YR 5/2), non-low plasticity, v. stiff, dry-most. <u>Fill Material</u> .	FM			
17							
7			Coal: 100%, black (10YR N2/1), nonplastic, moist-saturated. <u>Fill Material</u> . PID= 0.0ppm, no odor.	FM			Collected 3"x2" SS @ 2'-4' Drilled down to 4 feet Pulled augers; checked open borehole, no H ₂ O entering
12		1.9					
15			Clay: w/silt (C-15%), fine coarse sand 5%, and 5% fine-medium gravel, yellowish brown (10YR 5/6), low plasticity, medium stiff, dry, plant material in sample.	CL			
16							
5			Silty Clay: 20-25% silt, 5% fine-med sand, mottled yellowish brown (10YR 5/4) and gray (10YR 6/1), low-medium plasticity, medium stiff, dry.	CL			Collected 3"x2" SS @ 4'-6' Drilled down to 6 feet, hard drilling
9		1.9					
14							
25			Silty Clay: 20-25% silt, 5% fine-coarse sand, <5% small-large gravel, dark yellowish brown (10YR 4/4), low plasticity, v. stiff-hard, dry, gravel is subangular-subrounded, <u>Clay Till</u> , no apparent bedding.	CL			Collected 3"x2" SS @ 6'-8' Drilling down to 8 feet - V. hard drilling; taken 10 minutes to go 2 inches Took 40 minutes to drill 2 feet
16		2.0					
23							
26							
38			Silty Clay: 20-25% silt, 5-10% fine-coarse sand, <5% fine gravel, dark yellowish brown (10YR 4/6), low plasticity, hard, dry, gravel is subangular-subrounded, no apparent bedding, <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 8'-10' Drilling down to 10 feet (1318) V-hard drilling (1412) drilled down to 10 feet
10							
48			Silty Clay: 20-25% silt, 5% fine-coarse sand, <5% fine gravel, dark yellowish brown (10YR 4/6), low plasticity, hard, dry, gravel is subangular-subrounded, no apparent bedding, <u>Clay Till</u> - some gray (along fractures?)	CL			Collected 3"x2" SS @ 10'-12' Drilling down to 12 feet (1441) V-hard drilling (1524) Drilled down to 12 feet <i>1523 14076</i>
12		2.0					
26							
33							
43			Silty Clay: 20-25% silt, 5% fine-coarse sand, <5% fine gravel, dark yellowish brown (10YR 4/6), low plasticity, hard, dry, no bedding. <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 12-14 feet (1542) drilling down to 14 feet, v-hard drilling (1635) finished drilling to 14 feet
13		1.9					
23							
26			Silty Clay: 20-25% silt, 5% fine-coarse sand, very dark grayish brown (10YR 3.2), low plasticity, hard, dry, no bedding, <u>Clay Till</u> .	CL			
31							
8		2.0					
13			Clay: w/silt 15%-20%, 5% fine-medium sand, <5% subrounded, fine medium gravel, dark gray (10YR 4/1), low-medium plasticity, stiff, dry, no bedding, <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 14-16 feet (1647) drilling down to 16 feet

Fort Sheridan RI/FS

Log of Boring CSA1 SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15							
19	2.0			CL			
22							
10			Clay: w/silt 15%-20%, 5% fine-medium sand, <5% subrounded fine-medium gravel, dark gray (10YR 4/1), low-medium plasticity, medium stiff-stiff, dry, no bedding, <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 18-18 feet Drilled down to 18 feet
14	2.0						
20							
23							
7			Clay: w/silt 15%-20% silt, 5-10% fine-medium sand, <5% subrounded fine-medium gravel, dark gray (10YR 4/1), medium-high plasticity, medium stiff, dry, no bedding, <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 18-20 feet Drilled down to 20 feet 12/13/90 No H ₂ O in augers @ 20 feet
12	2.0						
16							
20							
23			Clay: w/silt 15%-20%, 5%-10% fine-coarse sand, <5% fine medium gravel, gray (10YR 6/1), medium-high plasticity, soft, dry, no bedding, <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 20-22 feet Drilled down to 22 Feet
9							
10	1.9						
15							
17							
7			Clay: w/silt 15%-20%, 5-10% fine-coarse sand, 5% fine-medium gravel, gray (10YR 6/1), medium-high plasticity, soft-medium stiff, dry, no bedding, <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 22-24 feet Drilled down to 24 feet
12	1.9						
18							
21							
8			Silty Clay: 20-25% silt, 5% fine-coarse sand, 5% fine-medium gravel, gray (10YR 6/1), medium-high plasticity, medium stiff, dry, no bedding, <u>Clay Till</u> .	CL			Collected 3"x2" SS @ 24-26 feet
14	2.0						
18							
22							
25							
30							Began mixing grout Measured to bottom of borehole, through augers 23.9' BGL Cement/Bentonite Grout Mixture 50 Gallons of H ₂ O 7 bags of Portland Type II Cement 35 lbs of Bentonite Tremed 1 st batch; approximately 80 gallons of grout- grout 4 feet BGL 2 nd Mixture 15 Gallons of H ₂ O 2 Bags of Portland 9 lbs of Bentonite 25-30 Gallons total Pumped 2nd batch to surface.

Log of Test Pit B128TP1

Fort Sheridan RI/FS

Contract Number CAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/21/91

Date Completed: 03/21/91

Total Depth of Trench: 13.5

Ground Elevation: 685.743

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/21/91	0808	0925	0	13.5

Abbreviations

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B128TP1

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Fill Material: asphalt.	FM	▲▲▲▲	
	Gravelly Sand: some medium to large gravel, trace fines, gray (10YR 5/1), nonplastic, moist, angular, Fill.	SP	●●●●	
	Gravelly Sand: some small to large gravel, trace fines, yellowish brown (10YR 5/6), nonplastic, moist, wet from 1.75 to 1.95 feet, angular, Fill.	SP	●●●●	
	Clay: little silt, few gravel, dark gray, (5Y 4/1), low plasticity, hard, dry.	CL	////	
5	Clay: little silt, few sand and gravel, mottled brown (10YR 5/3) with gray (10YR 6/1), low plasticity, hard, dry.	CL	////	
10	Clay: little silt, few gravel, mottled brown (10YR 5/3) with gray (5Y 6/1), low plasticity, hard, slightly moist.	CL	////	
15	Clay: little silt, few gravel, trace sand, gray (10YR 5/1), low plasticity, hard, slightly moist.	CL	////	

Log of Test Pit B128TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/20/91

Date Completed: 03/20/91

Total Depth of Trench: 13.5

Ground Elevation: 685.688

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/20/91	1305	1420	0	13.5

Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Fort Sheridan RI/FS

Log of Test Pit B128TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Fill Material: asphalt.	FM		
	Gravelly Sand: some gravel, trace fines, gray (10YR 6/1), nonplastic, moist, angular, Fill.	SP		
	Gravelly Sand: some gravel, trace fines, strong brown (7.5YR 5/6), nonplastic, moist, angular, Fill.	SP		
	Silty Clay: some silt, black, (7.5YR 2N/1), low plasticity, hard, slightly moist.	CL		
	Clay: little silt, few sand, trace gravel mottled yellowish brown (10YR 5/4) with gray (10YR 5/1), low plasticity, hard, slightly moist.	CL		
5				
	Clay: little silt, few gravel, brown (10YR 5/3) with minor gray (10YR 6/1) mottling, low plasticity, hard, slightly moist.	CL		
10				
	Clay: little silt, few gravel, trace sand, dark gray (10YR 4/1), low plasticity, hard, slightly moist, <u>Glacial Till</u> .	CL		
15				

Log of Test Pit B137TP1

Fort Sheridan RI/FS
Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 550K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/21/91

Date Completed: 03/21/91

Total Depth of Trench: 13.5

Ground Elevation: 681.155

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/21/91	1509	1615	0	13.5

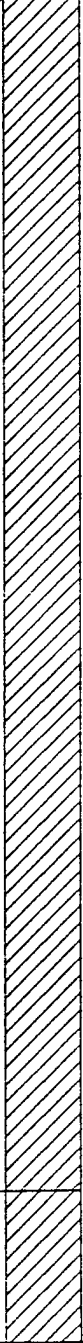
Abbreviations

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B137TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Sand: few fines and gravel, dark yellowish brown (10YR 4/4), nonplastic, moist, angular, <u>Fill</u> .	SP		some areas are comprised of crushed stone fill
	Clay: little silt, few gravel, trace sand, brown (10YR 5/3) with some gray (10YR 5/1) mottling, low plasticity, hard, dry.			sample at 2.5 feet
5	Clay: little silt, few gravel, brown (10YR 5/3) with gray (10YR 5/1) mottling, low plasticity, hard, dry.	CL		sample at 7.2 feet
10	Clay: little silt; few gravel, trace sand, dark gray (10YR 4/1), low plasticity, hard, slightly moist.	CL		
15				

Log of Test Pit B137TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/25/91

Date Completed: 03/25/91

Total Depth of Trench: 13.7

Ground Elevation: 681.561

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/25/91	0848	1001	0 -	13.7













Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit B137TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Gravelly Sand: some gravel, trace fines, white (5Y 8/1), nonplastic, moist, angular, <u>Fill</u> .	SP		
	Sandy Gravel: some sand, trace fines, very dark grayish brown (10YR 3/2), nonplastic, moist, angular, <u>Fill</u> .	GP		
	Sandy Gravel (coal): little sand (coal), black (2.5Y N2/), nonplastic, moist, angular, <u>Fill</u> .	CL		
	Clay: little silt, few gravel, trace sand, brown (10YR 5/3), low plasticity, slightly moist, <u>Fill</u> .	GP		
		CL		
	Sandy Gravel (coal): little sand (coal), trace fines, black (2.5Y N2/), nonplastic, dry, angular, <u>Fill</u> .	CL		
	Silty Clay: some silt, brown (10YR 5/3), low plasticity, dry.	CL		
	Clay: little silt, few sand, trace gravel, yellowish brown (10YR 5/4), low plasticity, slightly moist.	CL		
	Clay: little silt, few gravel, trace sand, brown (10YR 5/3) with gray (5Y 6/1) mottling, low plasticity, slightly moist.	CL		
5		CL		
10		CL		
15	Clay: little silt, few gravel, dark gray (5Y 4/1), low plasticity, slightly moist, <u>Glacial Till</u> .	CL		

Log of Test Pit B137TP3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/22/91

Date Completed: 03/22/91

Total Depth of Trench: 13.5

Ground Elevation: 680.820

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/22/91	0922	1125	0	13.5

Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Fort Sheridan RI/FS

Log of Test Pit B137TP3

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Gravelly Sand: some gravel (small), trace fines, light gray (10YR 7/1), nonplastic, moist, angular, <u>Fill</u> .	SP		
	Coat: little fines, black (10YR 2/1), nonplastic, slightly moist.	GP		
	Clay: little silt, few gravel, trace sand, brown (10YR 5/3) with some gray (10YR 6/1) mottling, low plasticity, hard, slightly moist, <u>Fill</u> .	CL		
	Gravel (coat): little sand (coat), black (10YR 2/1), nonplastic, dry, <u>Fill</u> .	GP		
	Clayey Silt: some clay, pale olive (5Y 5/3), low plasticity, hard, slightly moist.	ML		
5	Clay: little silt and gravel, brown (10YR 5/3) with gray (10YR 5/1), low plasticity, firm, moist.	CL		sample at 3.5 feet
	Clay: little silt, few gravel, trace sand, brown (10YR 5/3) with gray (5Y 6/1), low plasticity, hard, slightly moist.			sample at 6.7 feet
10	Clay: little silt, few gravel, trace sand, gray (10YR 5/1), low plasticity, hard, slightly moist, <u>Glacial Till</u> .	CL		
15				

Log of Test Pit B137TP4

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Mike Pozniak, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 5804

Soil Sampling Device: Side Hammer w/ .2" x 6" Brass Sleeve Inserts

Date Started: 03/21/91

Date Completed: 03/21/91

Total Depth of Trench: 13.5

Ground Elevation: 680.206

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/21/91	1136	1309	0	13.5






Abbreviations

Location Sketch

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Fort Sheridan RI/FS

Log of Test Pit B137TP4

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0				
	Gravelly Sand: some gravel, trace fines, light gray (5Y 7/1), nonplastic, wet, angular, <u>Fill</u> .	SP		
	Gravelly Sand: some gravel, few fines (clay), very dark gray (5Y 3/1), nonplastic, moist, angular, <u>Fill</u> .	GP		
	Gravelly Sand: some gravel, trace fines, light gray (5Y 7/1), nonplastic, moist, angular, <u>Fill</u> .			
	Sand-Gravel: some coarse sand, black (2.5Y N2/), nonplastic, moist, angular, <u>Fill</u> .			
	Clay: little silt, few gravel, trace sand, brown (10YR 5/3) with very minor gray (10YR 6/1) and oxidation, low plasticity, dry.	CL		
	Sandy Clay: some sand, few gravel, black (2.5Y N2/), low plasticity, wet.	CL		
	Silt: olive gray (5Y 5/2), nonplastic, hard, dry.	MH		
	Clay: little silt, few sand and gravel, brown (10YR 5/3) with gray (5Y 6/1), low plasticity, moist.			
	Clay: some silt, brown (10YR 5/3) with gray (5Y 6/1) mottling, low plasticity, hard, slightly moist.			

Log of Boring VES6SB01

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Don Maki, John Gutkowski, ESE, Inc.

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Drilling Rig: CME 55 Truck Mounted Rig Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2' Split Spoon

Date Started: 1/23/91 Date Completed: 1/24/91 Total Depth Drilled: 24.3

Water Level While Drilling (bgl): DRY Ground Elevation: 684.560

Completion Information

Water Level At Completion (bgl): DRY Date: 1/24/91

Grout Interval: 0-22.6

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/23/91	0930	1533	0	24.3
1/24/91	1000	1200	--	--

Abbreviations

Abbr.	Meaning
HSA	hollow stem auger
trace	= < 5%
few	= 5-10%
little	= 15-25%
some	= 30-45%
mostly	= 50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Boring VES6SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Asphalt.				
			Crushed gravel.	NL			Frozen soil and asphalt made taking SS from surface impossible.
			Dark grey clay with gravel.				
7		1.8	Clay: with little sand and fine to medium gravel, dark grey (5Y4/1) changing to yellowish brown at 1.3 ft, medium plasticity, soft, moist, with no apparent bedding and angular to subangular fine gravels.	CL			Some moisture in sand but not wet. Munsell color chart is referenced in the descriptions.
8							
9							
18			Sand: from 2.7-3' with some gravel, little clay, very moist, dark grey (5Y4/1) sand is nonplastic, medium dense with subangular to subrounded grains.	SP			
				NL			
16		2.0	Clay: trace fine to medium gravel, matrix yellowish brown (10YR 5/4) with light brownish grey (10YR6/2) and reddish brown (5YR4/4) mottles, medium plasticity, firm from 4-5 ft., hard from 5-6' below ground level, moist, no apparent bedding, angular grains, <u>Glacial Till</u> .	CL			Collected SS2. Hard drilling.
25							
35							
45		2.0	Clay: trace fine and medium gravel, matrix yellowish brown (10YR5/4) with light brownish grey (10YR6/2) and reddish brown (5YR4/4) mottles, medium plasticity, hard, moist, no apparent bedding, angular grains, <u>Glacial Till</u> .	CL			Collected SS3. Hard drilling.
10							
20							
29							
34		2.0	Clay: trace fine gravel, brown (10YR5/3), medium plasticity, hard, moist, no apparent bedding, angular grains, mottles are grey (10YR6/1), very few, <u>Glacial Till</u> .	CL			Collected SS4. Hard drilling.
15							
30							
31							
37		2.0	Clay: trace fine gravel, brown (10YR5/3) changing to dark grey (10YR4/1), medium plasticity, hard, moist, no apparent bedding, angular grains, <u>Glacial Till</u> .	CL			Collected SS5. Hard drilling.
14							
17							
29							
29		2.0	Clay: trace fine gravel, brown (10YR4/1), medium plasticity, hard, moist, no apparent bedding, angular grains, <u>Glacial Till</u> .	CL			Collected SS6. Hard drilling.
10							
12							
18		2.0					
20							
6		2.0	Clay: trace fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u> .	CL			Collected SS7.
12							

Fort Sheridan RI/FS

Log of Boring VES6SB01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15							
15	2.0			CL			
17							Collected SS8.
7			Clay: trace fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>				
17	2.0			CL			
22							
22							Collected SS9. Some small silty seams, moist but not saturated.
6			Clay: trace fine gravel with small silt seams, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>				
12	2.0			CL			
16							
20							Collected SS10. Some free water between sample and inside of spoon but center of sample is only moist; crating easier.
9			Clay: trace fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>				
13	2.0			CL			
20							
21							Collected SS11. Similar to 20-22'.
8			Clay: trace fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>				
13	2.0			CL			
15							
19							Collected SS12. Similar to 20-22' Total depth of drill 24.3'.
7			Clay: trace fine gravel, dark grey (10YR4/1), medium plasticity, firm, moist, no apparent bedding, angular grains, <u>Glacial Till</u>				
8	2.0			CL			
14							
18							Grouted borehole to surface: 9 bags Portland 75 gallons water 1/2 bag of bentonite gel.

Log of Test Pit CSA1TP1

Fort Sheridan RI/FS

Contract Number DAAA:5-90-D-0017

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/07/91

Date Completed: 02/07/91

Total Depth of Trench: 14.3

Ground Elevation: 676.526

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/07/91	1410	1800	0	14.3















Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
med	medium
BGL	Below Ground Level
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Fort Sheridan RI/FS

Log of Test Pit CSA1TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Clay: few sand and fine gravel, roots, dark brown (7.5YR 3/2), low plasticity, hard, moist, <u>Fill Material</u> .	CL		
	<u>Fill Material</u> : crushed rock, partially cemented, pale brown (10YR 8/3).	FM		
	Coat: black (2.5Y 2/0).	FM		
	Clay: little sand and fine to med gravel, brown (10YR 5/3) to strong brown (7.5YR 5/8).	CL		collected sample at 2.1 feet BGL
	Coat: exterior of fragments are olive brown (2.5Y 4/3), interior is black (2.5Y 2/0).	FM		
	<u>Fill Material</u> : crushed rock, partially cemented, pale brown (10YR 8/3).	FM		
	Clayey Silt: trace fine sand and fine to med gravel, dark grayish brown (2.5Y 4/2), slight plasticity, hard, <u>Glacial Till</u> .	ML		collected sample at 3.8 feet BGL
	Clay: trace fine sand and fine to med gravel, dark grayish brown (2.5Y 4/2), low plasticity, hard, moist, <u>Glacial Till</u> .	CL		
5	Clay: trace fine gravel, brown (10YR 5/3) with gray mottles (10YR 6/1), low plasticity, hard, moist.	CL		
		CL		collected sample at 7 feet BGL
		CL		
	Clay: trace fine sand, little silt, gray (10YR 5/1) with few gray mottles (10YR 6/1), low plasticity, hard, moist, <u>Glacial Till</u> .	CL		
	Clay: trace fine sand and silt, dark gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u> .	CL		-collected sample at 14.3 feet BGL -backfilled to surface
15		CL		

Log of Test Pit CSA1TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Andrew Granskog, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 550K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/07/91

Date Completed: 02/07/91

Total Depth of Trench: 14.8

Ground Elevation: 678.762

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching	
	Start	End	Start	Per Shift End
02/07/91	0930	1300	0	14.8


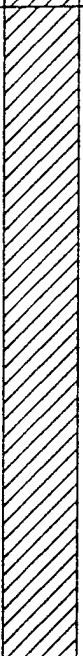
Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit CSA1TP2

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Clay: with trace fine gravel and sand, roots, very dark gray (10YR 3/1), low plasticity, soft, moist, <u>Topsoil</u>	CL		collected samples at 1.6 feet
	Clay: trace fine gravel and sand, roots, dark brown (10YR 3/2), low plasticity, hard, moist, <u>Glacial Till</u>	CL		
	Coat: black (2.5Y 2/0), <u>Fill Material</u>	FM		
	Clayey Silt: brown (10YR 5/3) with some yellowish brown mottles (10YR 5/8), low plasticity, firm, slightly moist, <u>Glacial Till</u>	ML		
	Clay: trace fine sand and silt, yellowish brown (10YR 5/4), low plasticity, firm, moist, <u>Glacial Till</u>	CL		
5	Clay: trace fine to med sand, brown (10YR 5/3) with strong brown (7.5YR 5/8) and gray (5Y 6/1) mottles, low plasticity, hard, moist, <u>Glacial Till</u>	CL		collected sample at 7.0 feet
10	Clay: trace fine to med sand, dk gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u>	CL		
15				

Log of Test Pit VES5TP1

Fort Sheridan RI/FS

Contract Number DAAA15-9C-D-0017

Geologist/Logger & Company: Tim Rhinehart, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/20/91

Date Completed: 02/20/91

Total Depth of Trench: 14.7

Ground Elevation: 688.797

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/20/91	0920	1226	0	14.7

Abbreviations

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES5TP1

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Cinder: few coal, few crushed stone: black (10YR 2/1), nonplastic, very dense, moist (frozen in upper zone). <u>Fill Material</u> .	TM		collected samples at 2.5 feet
5	Clay: little silt, few gravel (small), brownish yellow (10YR 6/6), light gray mottling (10YR 7/2), low plasticity, firm, dry. <u>Glacial Till</u> .	CL		
10	Clay: little silt, few gravel (some large), brownish yellow (10YR 6/5), light gray mottling (10YR 7/2), low plasticity, firm, dry. <u>Glacial Till</u> .	CL		-collected sample at 8.0 feet -some water sitting on bottom at 8 feet, water is run off from surface
15	Clay: little silt, few gravel (some large), dark gray (10YR 4/1), medium plasticity, firm, slightly moist. <u>Glacial Till</u> .	CL		-note during digging a change in clay color. -Iron staining noted in joint structures in top part of soil type. -collected sample at 14.7 feet

Log of Test Pit VES5TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Tim Rhinehart, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/20/91

Date Completed: 02/20/91

Total Depth of Trench: 14.5

Ground Elevation: 687.770

Water Level While Trenching (bgl): 7.4

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/20/91	1315	1500	0	14.5

Abbreviations

Location Sketch

<u>Abbr</u>	<u>Meaning</u>
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

B - 239

Log of Test Pit VES5TP3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 550K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/21/91

Date Completed: 02/21/91

Total Depth of Trench: 14.5

Ground Elevation: 686.034

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift:	
	Start	End	Start	End
02/21/91	1045	1330	0	14.5

Abbreviations

Abbr.	Meaning
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

1

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES5TP3

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Loose Gravel and Fill	FM		
	Silty Clay with Gravel 5 to 10% silt, -1% gravel, olive gray (SY 4/2), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
	Silty Clay with Gravel 5 to 10% silt, -1% gravel, dark grayish brown (10YR 4/2), mottled with gray (10YR 5/1), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
5				
	Silty Clay with Gravel 5 to 10% silt, -1% gravel, brown (10YR 5/3) mottled with gray (10YR 5/1), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		
10				
	Silty Clay with Gravel 5 to 10% silt, -1% gravel, dark gray (10YR 4/1), low plasticity, hard, moist, massive, homogeneous, <u>Glacial Till</u> .	CL		Transition to gray clay occurs at 12 ft.
15				

Log of Test Pit VES5TP4

Fort Sheridan RI/FS
Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Jane Ballien, ESE, Inc.	
Backhoe Operator & Company: Bob Bowman, ESE, Inc.	
Backhoe: Case 580K	
Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts	
Date Started: 03/06/91	Date Completed: 03/06/91
Total Depth of Trench: 14.0	Ground Elevation: 688.799
Water Level While Trenching (bgl): 0-5	

Trenching Shifts

Date	Time		Depth of Trenching	
	Start	End	Start	Per Shift: End
03/06/91	1130	1510	0	14.0






Abbreviations

Abbr.	Meaning
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES5TP4

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Fill Material: cobbles, asphalt, mostly gravel, some sand, limestone, subangular to angular gravel, wet.	FM		
	Clay: little sand, gravel, and silt, mottled yellowish brown (10YR 5/8), gray (10YR 5/1), and light olive brown (2.5 YR 5/6), low plasticity, firm, wet, <u>Glacial Till</u> .	CL		
	Clay: little sand, silt, and gravel, mottled greenish gray (5GY 6/1), yellowish brown (10YR 5/4), and brownish yellow (10YR 6/8), low plasticity, firm, wet, <u>Glacial Till</u> .	CL		Sample taken at 2.0 feet
5	Clay: little silt, few sand, few gravel, slightly mottled, mostly yellowish brown (10YR 5/4), some gray (10YR 5/1), few brownish yellow (10YR 6/8), low plasticity, hard, moist, angular gravel, <u>Glacial Till</u> .	CL		Sample taken at 7.0 feet
10	Clay: little silt, few gravel, some areas slightly mottled, mostly dk gray (10YR 4/1), little light olive brown (2.5Y 5/4), little to few greenish gray (5G 5/1), low plasticity, firm, some areas moist, some areas wet, angular to subangular gravel, <u>Glacial Till</u> .	CL		Sample taken at 14.0 feet
15				

Log of Test Pit VES6TP1

Fort Sheridan RI/FS

Contract Number DAAA:5-90-D-0017

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/05/91

Date Completed: 03/05/91

Total Depth of Trench: 14.4

Ground Elevation: 684.796

Water Level While Trenching (bgl): 5.5-7.0

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/05/91	1325	1630	0	14.4



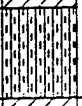

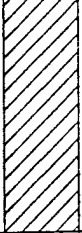
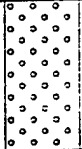
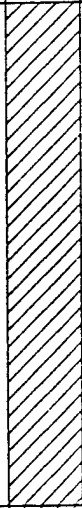

Abbreviations

Abbr.	Meaning
med	medium
dk	dark
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES6TP1

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Fill Material: asphalt, limestone, angular gravel.	FM		
	Clay: little silt, little sand, little gravel, slightly mottled, mostly gray (10YR 5/1), little light yellow brown (10YR 6/4), low plasticity, loose to med. dense, moist, angular gravel.	CL		
	Clay: little silt, little sand, little gravel, mottled, mostly brown (10YR 5/3), little light gray (2.5Y 7/0), few brownish yellow (10YR 6/8), low plasticity, hard, moist, subangular to angular gravel, <u>Glacial Till</u> .	ML		
	Clayey Silt: some clay, little sand, little gravel, few roots, mottled, mostly very dk. gray (10YR 3/1), some dk. gray (10YR 4/1), some light gray (10YR 7/1), and few dk. yellowish brown (10YR 4/4), low plasticity, loose, moist, subangular to angular gravel, <u>Glacial Till and Tosses</u> .	CL		sample taken at 3.0 feet
	Silty Clay: little gravel, mottled gray (10YR 6/1) and brown (10YR 5/3), low plasticity, slightly moist, firm, subangular to angular gravel, <u>Glacial Till</u> .	CL		
	Silty Clay: little gravel, few sand, mottled, mostly brown (10YR 5/3), some gray (10YR 6/1), few yellowish red (5YR 5/8), low plasticity, firm, moist, subangular to angular gravel, <u>Glacial Till</u> .			
5	Gravelly Sand: little silt, mottled, mostly yellowish brown (10YR 5/4), little gray (10YR 6/1), few yellowish red (5YR 5/8), low plasticity, wet, subangular gravel, med. grained sand, <u>Back Fill</u> .	SW		sample taken from 5.5 to 7.0 feet
	Silty Clay: little gravel, slightly mottled, mostly light yellowish brown (10YR 6/4), some gray (10YR 6/1), few yellowish red (5YR 5/8), low plasticity, hard, moist, subangular to angular gravel, <u>Glacial Till</u> .	CL		sample taken at 8.0 feet
10				
	Clay: little silt, few gravel, gray (10YR 5/1), low plasticity, hard, moist, subangular to angular gravel, <u>Glacial Till</u> .	CL		sample taken at 14.4 feet
15				

Log of Test Pit VES6TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 03/05/91

Date Completed: 03/05/91

Total Depth of Trench: 14.0

Ground Elevation: 684.962

Water Level While Trenching (bgl): 14.0

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
03/05/91	0830	1200	0	14






Abbreviations

<u>Abbr.</u>	<u>Meaning</u>
med	medium
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES6TP2

Depth (feet bgl)	Soil Description	USCS	Lithologic Log	Comments
		Classification		
0	Fill Material: asphalt, limestone, cobbles, very angular gravel.	FM		
	Silty clay: some silt, little sand, little gravel, little ash, somewhat mottled, mostly gray (10YR 5/1), little white ash (10YR 8/1), little greenish gray (5G 8/1), few very dark grayish brown (10YR 3/2), low plasticity, med dense, slightly moist, angular gravel.	CL		
	Silty Clay: some gravel, little sand, mottled, mostly brown (10YR 5/3), some gray (10YR 5/1), few greenish gray (5G 8/1), low plasticity, firm, moist, angular gravel, <u>Glacial Till</u> .	CL		sample collected at 2.0 feet
5	Silty Clay: little gravel, few sand, mottled, mostly brown (10YR 5/3), little gray (10YR 5/1), little yellowish red (5YR 5/3), few black spots (5YR 2.5/1), low plasticity, hard, moist, angular gravel, <u>Glacial Till</u> .	CL		sample collected at 7.0 feet
10				
	Clay: few silt, few gravel, gray (10YR 5/1), low to med plasticity, firm, moist, angular gravel, <u>Glacial Till</u> .	CL		-sample taken at 8.0 feet -sample collected at 14.0 feet -some Crisco oil? from hammer sprayed part of sample.
15				

Log of Test Pit VES6TP3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: Jane M. Ballien, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 58CK

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/12/91

Date Completed: 02/12/91

Total Depth of Trench: 6.4

Ground Elevation: 683.964

Water Level While Trenching (bgl): 3.25

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/12/91	0935	1430	0	6.4

Abbreviations

Abbr.	Meaning
med	medium
dk	dark
mm	millimeters
approx.	approximately
w/	with
trace	<5%
few	5-10%
little	15-25%
some	30-45%
mostly	50-100%

Location Sketch

Fort Sheridan RI/FS

Log of Test Pit VES6TP3

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Fill Material: asphalt	FM	▲▲▲▲	
	Fill Material: concrete	FM	▲▲▲▲	
	Clayey Silt: few med to coarse sand grains, little gravel, greenish gray (5GY 6/1) with trace of olive yellow stains (2.5Y 8/8), low plasticity, firm, moist, <u>Glacial Till</u>	ML	▨▨▨▨	
	Clayey Silt: little gravel, trace roots, very dark gray (10YR 3/1), few black dots approx 1mm in diameter (2.5Y 2/0), trace olive yellow staining (2.5Y 8/8), low plasticity, firm, moist, <u>Glacial Till</u>	ML	▨▨▨▨	
	Silty Clay: little gravel, few roots, dark gray (10YR 4/1), low plasticity, firm, moist, <u>Glacial Till</u>	CL	▨▨▨▨	sample taken from 1.95 to 2.0 feet
	Clay: trace gravel, very dark gray brown (10YR 3/2), little olive staining (5Y 5/3), low plasticity, firm, wet, <u>Glacial Till</u>	CL	▨▨▨▨	
	Clay: gray matrix (10YR 5/1) mottled with yellow (10YR 7/8) and light greenish gray grey (5BG 7/1), low plasticity, firm, wet, <u>Glacial Till</u>	CL	▨▨▨▨	-sample taken at 6.4 feet -encountered water at 3.25 feet which filled hole to 6.4 feet; soil description unknown 3.25 to 6.4 feet (assumed clay) -water source apparently an old abandoned sewer system
5				
10				
15				

Log of Test Pit VES7TP1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/24/91

Date Completed: 02/24/91

Total Depth of Trench: 14.5

Ground Elevation: 681.610

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/24/91	1423	1618	0	14.5

Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
med	medium
w/	with

Fort Sheridan RI/FS

Log of Test Pit VES7TP1

Depth (feet bgl)	Soil Description	USCS	Lithologic	Comments
		Classification	Log	
0	Topsoil	OL		
	Silty Clay: frost-shot and jointed, 10% silt, light yellowish brown (10YR 6/4) mottled with light gray (10YR 7/1), low plasticity, hard, moist, homogeneous, <u>Fill Clay</u> .	CL		
	Silty Clay: 10% silt, very dark grayish brown (10YR 3/2), low plasticity, firm to soft, moist, homogeneous, <u>Former Topsoil</u> .	CL		contact with above clay is irregular, suggesting dark zone is a former topsoil, which was overlain by clay fill.
	Silty Clay with Gravel 10% silt, <1% gravel, gray (10YR 6/1), low plasticity, firm, slightly moist, homogeneous, <u>weathered, Glacial Till</u> .	CL		-material shot through with rust veins -sample taken at 2.5 feet
	Silty Clay with Gravel 10% silt, <1% gravel, olive (5Y 5/3), low plasticity, hard, moist, homogeneous, gravel is rounded to subangular, <u>Glacial Till</u> .	CL		
5	Silty Clay with Gravel 10% silt, <1% gravel, brown (10YR 5/3), low plasticity, hard, moist, homogeneous, gravel is subangular to subrounded, <u>Glacial Till</u> .	CL		-mottled with light gray (10YR 7/1) to 6 feet below grade -1 large (1 foot) boulder found -sampled at 7 feet
10		CL		
15	Silty Clay with Gravel 5 to 10% silt, <1% gravel, gray (10YR 5/1), med plasticity, hard, moist, homogeneous, gravel is subrounded to subangular, <u>Glacial Till</u> .	CL		-sampled at 14.5 feet

Log of Test Pit VES7TP2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Backhoe Operator & Company: Bob Bowman, ESE, Inc.	
Backhoe: Case 580K	
Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts	
Date Started: 02/23/91	Date Completed: 02/23/91
Total Depth of Trench: 14.5	Ground Elevation: 676.027
Water Level While Trenching (bgl): 1.3	

Trenching Shifts

Date	Time		Depth of Trenching Per Shift	
	Start	End	Start	End
02/23/91	0912	1510	0	14.5




Abbreviations

Location Sketch

<u>Abbr.</u>	<u>Meaning</u>
med	medium
BGL	Below Grade Level
w/	with

Fort Sheridan RI/FS

Log of Test Pit VES7TP2

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Fill Material: loose gravel under 0.3 feet of blacktop.	FM		
5	Silty Clay and Gravel: 5 to 10% sil, approx. 1% gravel, <<1% cobbles, yellowish brown (10YR 5/4), low plasticity, firm, moist, massive, homogeneous, gravel is subrounded to subangular, cobbles are rounded, <u>Glacial Till</u> .	CL		<ul style="list-style-type: none"> -samples taken at 1.5 and 7.0 feet BGL -color changes to pale brown (10YR 6/3) and moisture content increases slightly -all other characteristics remain unchanging
10	Silty Clay and Gravel: 5 to 10% sil, <1% gravel, gray (10YR 5/1), med plasticity, hard, moist, massive, homogeneous, gravel subrounded to subangular, <u>Glacial Till</u> .	CL		samples taken at 14.5 feet BGL
15				

Log of Test Pit VES7TP3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Backhoe Operator & Company: Bob Bowman, ESE, Inc.

Backhoe: Case 580K

Soil Sampling Device: Slide Hammer w/ 2" x 6" Brass Sleeve Inserts

Date Started: 02/23/91

Date Completed: 02/23/91

Total Depth of Trench: 14.5

Ground Elevation: 676.198

Water Level While Trenching (bgl):

Trenching Shifts

Date	Time		Depth of Trenching Per Shift:	
	Start	End	Start	End
02/23/91	1550	1730	0	14.5

Abbreviations

Location Sketch

Abbr. Meaning

med medium
w/ with

Fort Sheridan RI/FS

Log of Test Pit VES7TP3

Depth (feet bgl)	Soil Description	USCS Classification	Lithologic Log	Comments
0	Topsoil: black (10YR 2/1), low plasticity, loose, moist, homogeneous, <u>sod</u> .	OL		
	Silty Clay: 10% silt, very dark gray (10YR 3/1), low plasticity, firm, moist, <u>Fill Clay</u> .	CL		
	Fill Material: loose gravel fill	FM		
	Silty Clay with Coal: 10% silt, <1% coal, yellowish brown (10YR 5/4), mottled with dark gray (10YR 4/1), low plasticity, soft, moist, homogeneous, <u>Fill Clay</u> .	CL		
	Silty Clay: 10% silt, dark olive gray (5Y 3/2), low plasticity, hard, moist, homogeneous, <u>Glacial Till</u> : 2.0 to 2.2 feet	CL		-2.0 to 2.2 feet interval contained 1 very angular dark chert fragment 1 1/2 inches -subrounded gravel stones found 2.2 to 2.4 feet -samples taken at 2.5 feet
	Silty Clay: 10% silt, black (2.5Y 1/0), low plasticity, firm, moist, homogeneous, <u>Glacial Till</u> : 2.2 to 2.4 feet	CL		
	Silty Clay: 20% silt, gray (5Y 6/1), nonplastic, very soft, slightly moist, homogeneous, <u>Glacial Till</u> : 2.4 to 3.3 feet	CL		
	Silty Clay with Gravel: 10% silt, <1% gravel, dark olive gray, (5Y 3/2), low plasticity, hard, moist, homogeneous, <u>Glacial Till</u> .	CL		
	Silty Clay with Gravel: 10% silt, <1% gravel, brown (10YR 5/3), mottled with gray (N5/1), low plasticity, hard, moist, homogeneous, <u>Glacial Till</u> .	CL		
5				
	Silty Clay with Gravel: 5-10% silt, <1% gravel, brown (10YR 5/3), low plasticity, hard, moist, homogeneous, <u>Glacial Till</u> .	CL		
10				
	Silty Clay with Gravel: 5 to 10% silt, <1% gravel, gray (10YR 5/1), med plasticity, hard, moist, homogeneous, <u>Glacial Till</u> .	CL		
15				

Log of Well B115 MW01

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 11/14/90 Date Completed: 11/15/90

Total Depth Drilled: 24

Water Level While Drilling (bgl):

Ground Elevation: 679.55'

Completion Information

Water Level At Completion (bgl):	Date: 11/15/90
Screened Interval: 12.5-22.5	Filter Pack Interval: 8.5-23.9
Screen Length: 10	Bentonite Seal Interval: 5.0-8.5
End Cap Length: 0.35	Grout Interval: 0-5.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 15	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 681.986	Protective Casing Length/AG: 5/2.69

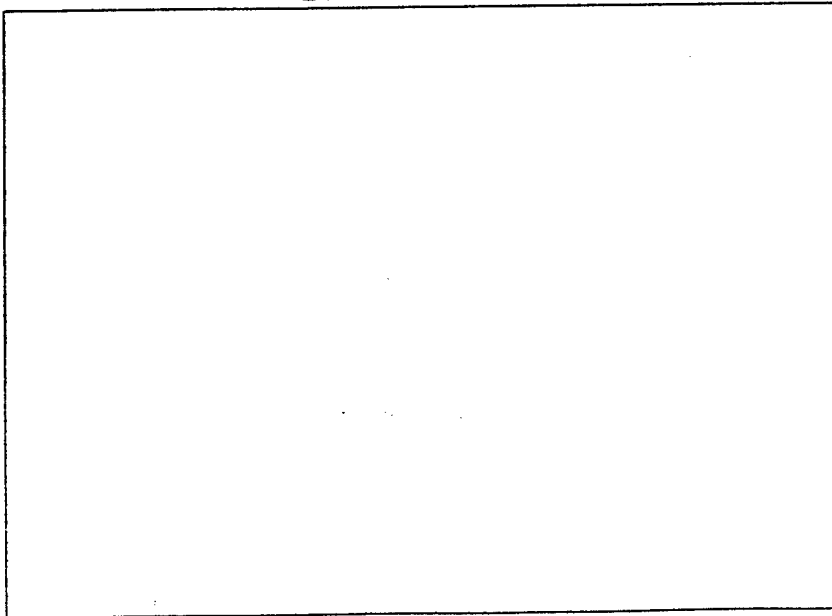
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/14/90	1300	1700	0	10
11/15/90 *	0900	1300	10	24

Abbreviations

Abbr.	Meaning
2xSS	2" x 2" Split Spoon Sampler
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch



Fort Sheridan RI/FS

Log of Well B115 MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0							
7			Silty Clay: 25% silt, 5% fine-coarse sand, dark yellow-brown (10YR4/6), Non-Plastic - Low Plasticity, soft-medium stiff, dry, no bedding. <u>Fill Material</u> to 1 foot, 1" thick cinder or coal layer (black) 1'-1.4' less 0.2 feet of topsoil at surface.	CL			Will use 2" x 2' spoons first, if recovery is sufficient, 2xSS @ 0'-2'. Not enough recovery - will push another sampler from 0'-2'. Drilled to 2', changing to 3" x 2' sampler to insure adequate sample.
9	1.4						
10							
18							
9			Silty Clay: 25% silt, 15% fine sand, 5% coarse sand-medium gravel, yellowish-brown (10YR5/8), low plasticity, soft, dry, no bedding, gravel angular. <u>Clay Till</u> .	CL			3xSS @ 2'-4' Drilling down to 4', harder drilling @ 3.5 feet bgl. 2/2/91
12	2.0						
17							
21							
10			Silty Clay: 25% silt, 5% fine-coarse sand, <5% fine-medium angular gravel, mottled yellowish brown (10YR5/8) and grey (10YR5/1), low plasticity, stiff-hard, dry, no apparent bedding, sand & gravel is angular. <u>Clay Till</u> .	CL			Drilling down to 6" center bit stuck in augers. Attempting to remove Center bit is properly inserted, will now drill down to 6" Very hard drilling at 4.5 feet
21	2.0						
30							
35							
16			Silty Clay: 25% silt, 5-10% fine-coarse sand, 5% fine-large gravel, dark yellowish brown (10YR4/6), non-clastic plasticity, hard, dry, no apparent bedding, sand & gravel are subangular-angular. <u>Clay Till</u> .	CL			Collected 3xSS @ 6'-8' Drilling down to 8 feet Very Hard drilling
27	2.0						
46							
45							
11			Silty Clay: 25% silt, 5-10% fine-coarse sand, <5% fine-large gravel, dark yellowish brown (10YR4/6), nonclastic-low plasticity, hard, dry, no bedding or fabric, gravel & sand rounded-angular. <u>Clay Till</u> . Gradational more gray in color towards bottom of sampler in last 6 inches, also slightly softer and more plastic - gradational contact (?).	CL			Collected 3xSS @ 8'-10' Drilled down to 10 feet
27	2.0						
37							
43							
5			Clay: with silt, 5%, 5% fine-coarse sand, 5% fine-large gravel, Dark Gray (10YR4/1), Medium plastic, stiff-very stiff, dry, no bedding, <u>Clay Till</u> .	CL			Collected 3xSS @ 10'-12' 11/15/91 Setting back up on augers Drilling down to 12 feet 2"-3" of water in bottom of augers. Pulling augers to see how much water in borehole. Remove augers with approximately 1/2" to 1" of water in borehole Let stand open for 10 minutes, with no new accumulation And no water observed running into borehole. Drilling down to 12 feet
14	1.9						
21							
26							
7			Clay: with silt 5%, 10% fine-med sand, <5% fine-med gravel, Dark Gray (10YR4/1), medium-high plasticity, medium stiff, dry-moist, no-bedding, gravel angular-subangular, <u>Clay Till</u> .	CL CH			
14	2.0						
20							
30			Silty/sandy clay: 30% silt, 45% very fine sand, 5% coarse sand, Dark Gray (10YR 4/1), medium-high plasticity, soft, moist-wet, medium stiff, no bedding, <u>Clay Till</u> .	CL			3"x2" SS @ 12'-14' Drilling down to 14'
7	2.0						3"x2" SS @ 14'-16' Drilling down to 16' Last 6 feet of drilling somewhat easier than first 10 feet.
12			Clay: with silt 10-15% silt, <5% fine-coarse sand, <5% fine gravel, Dark Gray (10YR 4/1), medium	CL CH			

Fort Sheridan RI/FS

Log of Well B115 MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
15			plasticity, medium stiff, dry, very slightly moist, no bedding, sand and gravel are angular, <u>Clay Till</u>	OP IT			
17	2.0						
27			Clay, with silt 10-15%, <5% fine-coarse sand, <5% fine gravel, Dark Gray (10YR 4/1), medium plasticity, medium stiff - stiff, dry, no apparent bedding, sand and gravel angular, <u>Clay Till</u>	CL			3"x2" SS @ 16'-18' Drilling down to 18'
7							
11	2.0						
17							
19			Clay, with silt 5-10%, <5% fine-coarse sand, <5% fine gravel, Dark Gray (10YR 4/1), medium-high plasticity, stiff-medium stiff, moist, no apparent bedding, sand and gravel is angular, <u>Clay Till</u>	OP IT			3"x2" SS @ 18'-20' Drilling down to 20 feet
4							
9	2.0						
11							
20			Clay, with silt 10-15%, <5% fine-coarse sand, <5% fine-medium gravel, Dark Gray (10YR 4/1), Medium-High plasticity, soft-medium stiff, dry-moist, no apparent bedding, sand and gravel subangular-angular, <u>Clay Till</u>	OP IT			3"x2" SS @ 20'-22' Drilling down to 22 feet
4							
7	2.0						
11							
14			Clay, with silt 15-20%, <5% fine-coarse sand, <5% fine-large gravel, Dark Gray (10YR 4/1), medium-high plasticity, medium stiff, dry, no bedding, sand and gravel is subangular to angular, <u>Clay Till</u>	OP IT			3"x2" SS @ 22'-24' Drilling down to 24 feet
6							
9	1.9						
13							
17			Clay, with silt 15-20%, <5% fine - coarse sand, <5% fine-large gravel, Dark Gray (10YR 4/1), medium-high plasticity, medium stiff, dry-moist, no bedding, sand and gravel is subangular-angular, <u>Clay Till</u>	OP IT			3"x2" SS @ 24'-26' Pulling augers in preparation to set well Measured depth to bottom of open borehole = 23.9' Begin Well Installation 2200 372
5							
10	2.0						
13							
17							
25							
30							Screen = 10.0' Bottom Cap = 0.35' Casing = 10.0' + 5.0' Sandpack to 8.5' BGL (24'-8.5') - 5 bags of sand Bottom of well @ 22.85 Bottom of screen @ 22.5 (.35' bottom cap) Top of screen @ 12.5' Bentonite hole plug to 5 feet BGL - hydrated - 3 gallons of H ₂ O Cement/Grout mixture Bentonite 15 lbs. Cement: 3 bags (94 lbs portland type II) Water: 25-30 Gallons

Log of Boring B115SB02

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 11/15/90 Date Completed: 11/16/90

Total Depth Drilled: 24

Water Level While Drilling (bgl):

Ground Elevation: 679.403

Completion Information

Water Level At Completion (bgl):

Date: 11/16/90

Grout Interval: 0-24

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/15/90	1415	1740	0	10
11/16/90	0830	1230	10	24

Abbreviations

Location Sketch

Abbr.	Meaning
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Fort Sheridan RI/FS

Log of Boring B115SB02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0							
17			Sandy Gravel: 25% fine-coarse sand, Light Gray (10YR 7/1), non-plastic, loose, dry, no bedding, subangular-angular, <u>Fill Material</u> .	GW			11/15/90 3"x2" SS sampler 0'-2' Drilled Down to 2 feet
26	1.7		Coal/Cinders: black (2.5YR N2.5), angular fragments, <u>Fill Material</u> .	FM			
18							
14			Coal/Cinders: 20% clay, black (2.5YR N2.5), angular fragments, <u>Fill Material</u> , --Slight Fyol Odor	FM			3"x2" SS 2'-4' Hit obstruction after drilling 6 inches. Pulled sampler out - rocks in nose cone. will attempt again. Composited 2nd and first spoon samples - obstruction w/gravel in nose cone. Drilling down to 4 feet
19							
33	1.5		Sandy Gravel: 25% fine-coarse sand, Light Gray (10YR 7/1), nonplastic, loose, dry, no bedding, gravel fine-large, subangular- subrounded, <u>Fill Material</u> .	GW			
12				CL			
18							
6			Sandy Clay: 25% fine sand, <5% fine-med subangular gravel, dark yellowish brown (10YR 4/6), low plasticity, medium stiff - stiff, dry, no bedding, <u>Clay Till (2)</u> .	CL			3"x2" SS @ 4'-6" Drilling down to 6 feet
15	1.9						
19			Silty Clay: 25% silt, 10% fine sand, <5% fine-med gravel, mottled dark yellowish brown (10YR 4/6) and gray (10YR 5/1), low plasticity, stiff, one 1" coal/cinder/ash layer at 4.5'	CL			
26							
14			Silty Clay: 25% silt, <5% fine-coarse sand, <5% fine - large gravel, mottled dark yellowish brown (10YR 4/6) and gray (10YR 5/1), low plasticity, hard, dry, no bedding, <u>Clay Till</u> .	CL			3"x2" SS @ 6'-8" Drilling down to 8 feet Very Hard Drilling.
24	2.0						
33							
50							
5			Silty Clay: 20-25% silt, <5% fine-coarse sand, <5% fine-large gravel, dark yellowish brown (10YR 4/6), low plasticity, hard, dry, no bedding, sand and gravel is angular, <u>Clay Till</u> .	CL			3"x2" SS @ 8'-10' Drilling down to 10 feet Very hard drilling. Has taken 15 minutes to drill down 0.8 foot. Drilling down to 10 feet
23	1.7						
31							
40			Silty Clay: 20-25% silt, 5-10% fine-coarse sand, 5% fine-med gravel, dark yellowish brown (10YR 4/6), low plasticity, Hard, dry, no apparent bedding, sand and gravel is angular, <u>Clay Till</u> .	CL			3"x2" SS @ 12'-14' 11/16/90 Drilling down to 12 feet - Changed drill bit - Very Hard Drilling
12							
30	2.0						
41							
50							
11			Clay: w/silt 15-20% silt, <5% fine-coarse sand, <5% fine-med gravel, dark grayish brown (10YR 5/2), low plasticity, hard, dry, no apparent bedding, <u>Clay Till</u> - transitional zone - some oxidation along fractures	CL			3"x2" SS @ 12'-14' Drilling down to 14 feet 0847; Drilling very hard
19	2.0						
26							
29							
8	2.0		Clay: w/silt 15-20%, <5% fine-coarse sand, <5% small-medium gravel, dark gray (10YR 4/1), low-medium plasticity, stiff-v stiff, dry, no bedding, <u>Clay Till</u> .	CL			3"x2" SS @ 14'-16' Drilling down to 16 feet Somewhat easier drilling
15							

Cement Grout

Fort Sheridan RI/FS

Log of Boring B115SB02

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
5							
22	2.0			CL			
23							
8			Clay: w/silt 10-15%, <5% fine-medium sand, 5% small-large gravel, dark gray (10YR 4/1), medium plasticity, stiff-v. stiff, dry, no bedding, <u>Clay Till</u> . Gravel is angular-subangular.	CL			3"x2" SS @ 16"-18" Drilling Down to 18 feet
16	2.0						
20							
24			Clay: w/silt 15-20% silt, <5% fine-medium sand, 5-10% small-large gravel, dark gray (10YR 4/1), medium-high plasticity, medium stiff-stiff, no bedding, <u>Clay Till</u> (?)	CLH			3"x2" SS @ 18"-20" Drilling Down to 20 feet Somewhat easier drilling
7							
12	2.0						
16							
21			Clay: w/silt 15-20%, <5% fine-medium sand, 5% small-medium gravel, dark gray (10YR 4/1), medium-high plasticity, medium stiff, no bedding, <u>Clay Till</u> (?)	CLH			3"x2" SS 20"-22" Drilling Down to 22 feet
6							
11	2.0						
16							
14			Clay: w/silt 15%, <5% fine-medium sand, 5% small-large angular gravel, dark gray (10YR 4/1), medium-high plasticity, medium stiff-stiff, no bedding, <u>Clay Till</u>	CLH			3"x2" SS 22"-24" Drilling Down to 24 feet
8							
12	2.0						
16							
20			Clay: w/silt 15-20%, <5% fine-med sand, 5% small-large gravel, dark gray (10YR 4/1), medium-high plasticity, medium stiff-stiff, no bedding, <u>Clay Till</u>	CLH			3"x2" SS @ 24-26 feet
7							
11							
14							
18							
							Mixing Cement/grout 50 Gallons H ₂ O 7 bags 94 lb Type II Cement 40 lbs Bentonite Powder Measured down inside augers/borehole > open to 24 feet. Will grout through tremie pipe.. Mixing 2 nd batch of grout (grout approximately 10.5 feet below ground level) 30 Gallons H ₂ O 5 bags Cement 30 lbs Bentonite Hole grouted to surface used both batches approximately 90 gallons of grout.
30							

Log of Boring B115 SB03

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 11/26/90 Date Completed: 11/26/90

Total Depth Drilled: 24

Water Level While Drilling (bgl):

Ground Elevation: 679.20i

Completion Information

Water Level At Completion (bgl):

Date: 11/26/90

Grout Interval: 0-24

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/26/90*	1045	1915	0	24

Abbreviations

Abbr.	Meaning
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below ground Level

Location Sketch

Fort Sheridan RI/FS

Log of Boring B115 SB03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0							
6			Silty Clay: 30% silt, 5% fine-medium sand, 15% gravel, mottled black (IOYR 2/1), and dark yellowish brown (IOYR 4/4), low plasticity, dry, soft-medium stiff, no textures or bedding. <u>Top Soil, Roots, grass.</u>	OL			11/26/90 3"x2" SS sampler 0'-2' Hit something hard at 1.8'; Will remove spoon and investigate.
7		1.6		CL			- Concrete debris Drilling Down to 2 feet Hit concrete
12			Silty Clay: 25% silt, 20% gravel (small-large), 5% fine-medium sand, dark yellowish brown (IOYR 4/8), some black areas, low plasticity, dry, medium stiff, <u>Fill Material.</u>				Moved rig back 2.5 feet - moved south; towards UST
7			Last 3 inches of spoon (0.2 feet) almost 100% gravel sized (med) concrete debris.				Drilled down to 2 feet Hit concrete again at 1.7 feet Will move north of original borehole 2-2.5 feet
4				CL			
7		1.3	Clay: w/silt 15%, 5% fine-coarse sand, olive brown (2.54 4/4) low-med plasticity, dry-moist, soft-medium stiff, no bedding.				3"x2" SS 2'-4' Drilled down to 4 feet
8			0.4 feet of black moist coally fill material @ 2 feet.				
12				CL			
5			Silty Clay: 25% silt, 5% fine-medium sand, <5% small large gravel (angular), mottled dark yellowish brown (IOYR 4/6) and light gray (IOYR 7/1), low plasticity, v. stiff-hard, dry, no bedding, gravel is angular. <u>Clay Till.</u>	CL			3"x2" SS @ 4'-6' Drilled down to 6 feet very hard drilling will push first 6" of spoon @ 6'-8' feet because hammer restricted by hydraulic line.
13		1.7					
17				CL			
26							
--			Silty Clay: 25% silt, 5% fine-coarse sand, <5% small-medium gravel (subangular - angular), mottled dark yellowish brown (IOYR 4/6), and light gray (IOYR 7/1), low plasticity, hard, dry, no bedding, oxidized along fractures. <u>Clay Till.</u>	CL			3"x2" SS @ 6'-8' Drilling down to 8 feet Very Hard Drilling.
25		2.0					
33				CL			
45							
5			Silty Clay: 25% silt, 5% fine-coarse sand, <5% small-medium gravel (subangular-angular), dark yellowish brown (IOYR 4/6), low plasticity, hard, dry, no bedding. <u>Clay Till.</u>	CL			3"x2" SS @ 8'-10' Drilling down to 10 feet Very hard drilling.
19		1.8					
29				CL			
46							
8			Clay: with silt 15-20%, 5% fine-coarse sand, very dark grayish (IOYR 3/1), low-medium plasticity, v. stiff, dry, no bedding. <u>Clay Till.</u> <5% small gravel (angular), some oxidation along fractures.	CL			3"x2" SS @ 10'-12' Drilling down to 12 feet
17		2.0					
22				CL			
32							
5			Clay: with silt 15-20% silt, 5% fine-coarse sand, <5% small-medium gravel (subrounded-subangular), dark gray (IOYR 4/1), medium-high plasticity, stiff, dry, no bedding. <u>Clay Till</u> or Lacustrine (?)	CL CH			3"x2" SS @ 12'-14' Drilling down to 14 feet
14		2.0					
20				CL CH			
24							
5		2.0	Clay: with silt 10-15%, 5% fine-coarse sand, <5% small-large gravel (subrounded-subangular), dark gray (IOYR 4/1), medium-high plasticity, medium stiff, dry, no bedding. <u>Clay Till</u> or Lacustrine (?)	CL CH			3"x2" SS @ 14'-16' Drilling down to 16 feet
13							

Cement Grout

Fort Sheridan RI/FS

Log of Boring B115 SB03

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
15							
16	2.0			CP	IF		
19							
5			Clay; with silt 10-15%, 5% fine-coarse sand, dark gray (10YR 4/1), medium-high plasticity, stiff-medium stiff, dry, no bedding, Clay Till or Lacustrine (?)	CP	IF		3"x2" SS @ 16'-18' Drilling Down to 18 feet
10	2.0						
13							
17							
3			Clay; with silt, 15-20%, 5% fine-coarse sand, dark gray (10YR 4/1), high plasticity, soft, dry-moist, no bedding Clay Till or Lacustrine (?)	CH			3"x2" SS @ 18'-20' Drilling Down to 20 feet
7	2.0						
10							
14							
20							
5			Clay; with silt 15%, 5% fine-coarse sand, dark gray (10YR 4/1), high plasticity, soft, dry-moist, no bedding, Clay Till or Lacustrine (?)	CP	IF		3"x2" SS 20'-22' Drilling Down to 22 feet
8	2.0						
12							
15							
7			Clay; with silt 10%, 5% fine-coarse sand, <5% small-large gravel (angular), high plasticity, soft-medium stiff, dry, no bedding, Clay Till or Lacustrine, gravel composed almost entirely of calcareous shale.	CH			3"x2" SS 22'-24' Drilling Down to 24 feet 1200 500
10	2.0						
12							
15							
6			Clay; with silt, 15-20%, 5% fine-coarse sand, <5% small-medium gravel, medium-high plasticity, soft-medium stiff, dry, no bedding, Clay Till (?) or Lacustrine, Gravel is subangular-subrounded.	CP	CH		3"x2" @ 24-26 feet End of boring sounded bottom of borehole -open to 24' BGL Mixing Grout 70 Gallons of H ₂ O 9 bags Portland 30 lbs Bentonite Powder could not add more bentonite because mixture becoming too thick for moyno pump. Grouted to 0.5' below ground level. Pumped total of 100 gallons of grout.
7							
13							
20							
25							
30							

Log of Boring B122SB1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 1/28/91

Date Completed: 1/28/91

Total Depth Drilled: 5

Water Level While Drilling (bgl): Dry

Ground Elevation: 672.636

Completion Information

Water Level At Completion (bgl): Dry

Date: 1/28/91

Grout Interval: 0-5

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/28/91	0000	1222	0	5

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

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Log of Boring B122SB12

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Pete Buell, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 7/10/91

Date Completed: 7/10/91

Total Depth Drilled: 14

Water Level While Drilling (bgl): Dry

Ground Elevation: 672.282'

Completion Information

Water Level At Completion (bgl): Dry

Date: 7/10/91

Grout Interval: 0'-1'

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/10/91	1404	1450	0	14

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
shed	schedule
FM	fill material
NL	not logged
some	25-35%
little	15-25%
few	5-10%
trace	<5%
PID	photoionization detector
ppm	parts per million

Location Sketch

Fort Sheridan RI/FS

Log of Boring B122SB12

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0		Asphalt:	FM			No sample was obtained from 0 to 1 foot due to the asphalt and crushed stone. This interval was logged from the soil cuttings.
		Crushed Stone and Gravel: light grey (10YR7/1), non-plastic, moist, fill material	FM			
		This interval was not logged.				Sample from 1 to 4 feet had no sample recovery. Screening of the breathing air with a PID was 0.0 ppm.
0			NL			Driller interpreted that clay was encountered at a depth of 3.5 feet.
5		Clay: some silt, few gravel, trace sand, yellowish brown (10YR5/4) with areas of grey (10YR6/1), low plasticity, slightly moist	CL			Sample from 4 to 9 feet was obtained at 1425 hours. Headspace screening of the sample with a PID was 0.0 ppm.
10		Clay: some silt, few sand, trace gravel, brown (10YR5/3) with grey (10YR6/1) increasing with depth, low plasticity, moist	CL			Sample from 9 to 14 feet was obtained at 1440 hours. Headspace screening of the sample with a PID was 0.0 ppm.
15		Clay: some silt, few gravel, trace sand, grey (10YR5/1), low plasticity, slightly moist	CL			

Log of Boring B122SB2

Fort Sheridan RI/FS

Contract Number DAAA15-90-C-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 2 inch diameter, 2 foot Split Spoon

Date Started: 1/29/91

Date Completed: 1/29/91

Total Depth Drilled: 5

Water Level While Drilling (bgl): Dry

Ground Elevation: 672.472

Completion Information

Water Level At Completion (bgl): Dry

Date: 1/29/91

Grout Interval: 0-5

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/28/91	1100	1222	0	5

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Location Sketch

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Log of Boring B122SB3

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 1/29/91 Date Completed: 1/29/91

Total Depth Drilled: 5

Water Level While Drilling (bgl): Dry

Ground Elevation: 672.479

Completion Information

Water Level At Completion (bgl): Dry

Date: 1/28/91

Grout Interval: 0-5

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/28/91	1418	1533	0	5



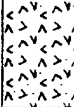


Abbreviations

Location Sketch

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Fort Sheridan RI/FS

Log of Boring B122SB3

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Asphalt:	FM		 Cement Grout	No sample was obtained from 0 to 3.5 feet due to asphalt and frozen fill material. This interval was logged from soil cuttings.
			Frozen Fill: Fill of unidentified debris including cinders, <u>Fill Material</u>	FM			
			Fill: Fill of unidentified debris including cinders, <u>Fill Material</u>	FM			
1.5			Silty Clay with Gravel 5-10% silt, <1% gravel, brown (10YR5/3), low plasticity, hard, moist, no apparent bedding, <u>Native Fill</u>	CL			Sample from 3.5 to 5 feet was obtained at 1520 hours. PID reading of breathing zone was 0.0 ppm. PID reading of sample was 0.0 ppm.
10							
15							

Log of Boring B122SB4

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat :

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 2 inch diameter, 2-foot Split Spoon

Date Started: 1/29/91 Date Completed: 1/29/91

Total Depth Drilled: 5

Water Level While Drilling (bgl): 5

Ground Elevation: 672.227

Completion Information

Water Level At Completion (bgl):*Dry

Date: 1/28/91

Grout Interval: 0-5

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/29/91	1325	1355	0	5

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Location Sketch

Log of Boring B122SB4

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Log of Boring B122SB5

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 1/29/91

Date Completed: 1/29/91

Total Depth Drilled: 7

Water Level While Drilling (bgl): Dry

Ground Elevation: 671.536

Completion Information

Water Level At Completion (bgl): Dry

Date: 1/29/91

Grout Interval: 0-7

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/29/91	0631	1000	0	7

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Location Sketch

Fort Sheridan RI/FS

Log of Boring B122SB5

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Asphalt:	FM			No sample was obtained from 0.0 to 2.0 feet due to asphalt and frozen fill material.
			Frozen Fill: Fill of unidentified debris. Organic material throughout grab sample.	FM			
0.0			Silty Clay with Gravel: 5-10% silt, <1% gravel, grayish brown (10YR4/2), medium plasticity, firm, moist, no apparent bedding. <u>Glacial Till</u>	CL			Grab samples from 2 to 7 feet were obtained at 1000 hours. Organic material throughout samples. PID reading of sample was 0.0 ppm.
5							
10							
15							

Log of Boring B122SB6

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 1/29/91

Date Completed: 1/29/91

Total Depth Drilled: 5

Water Level While Drilling (bgl): Dry

Ground Elevation: 671.496

Completion Information

Water Level At Completion (bgl): Dry

Date: 1/29/91

Grout Interval: 0-5

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/29/91	1400	1440	0	5

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Location Sketch

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Log of Boring B122SB7

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James W. Ashley, ESE, Inc.

Drilling Rig: Brat :

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 2-Foot Split Spoon Sampler

Date Started: 1/23/91 Date Completed: 1/29/91

Total Depth Drilled: 5

Water Level While Drilling (bgl): Dry

Ground Elevation: 670.952

Completion Information

Water Level At Completion (bgl): Dry

Date: 1/29/91

Grout Interval: C-5

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/29/91	1449	1551	0	5

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Location Sketch

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Asphalt:	FM			No sample was obtained from 0.0 to 1.5 feet due to asphalt and frozen fill material.
			Frozen Fill: Fill of unidentified debris.	FM			
8			Silty Clay with Gravel 5-10% silt, <1% gravel, brown (10YR5/3) low plasticity, hard, moist, no apparent bedding. <u>Glacial Till</u>	CL			
10		2.0					Grab samples were taken from 1.5 to 3.0 feet. Split spoon sample was taken from 3.0 to 5.0 feet at 1453 hours. PID reading of background was 5.2 ppm. PID reading of sample was 5.2 ppm.
15							

Log of Boring B122SB8

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.	
Geologist/Logger & Company: James W. Ashley, ESE, Inc.	
Drilling Rig: Brat I	Drilling Method: 6 1/4" HSA
Soil Sampling Device: Laskey Sampler	
Date Started: 1/29/91	Date Completed: 1/29/91
Total Depth Drilled: 7	
Water Level While Drilling (bgl): Dry	Ground Elevation: 671.780

Completion Information

Water Level At Completion (bgl): Dry	Date: 1/29/91
Grout Interval: 0-7	

NO WELL INSTALLED

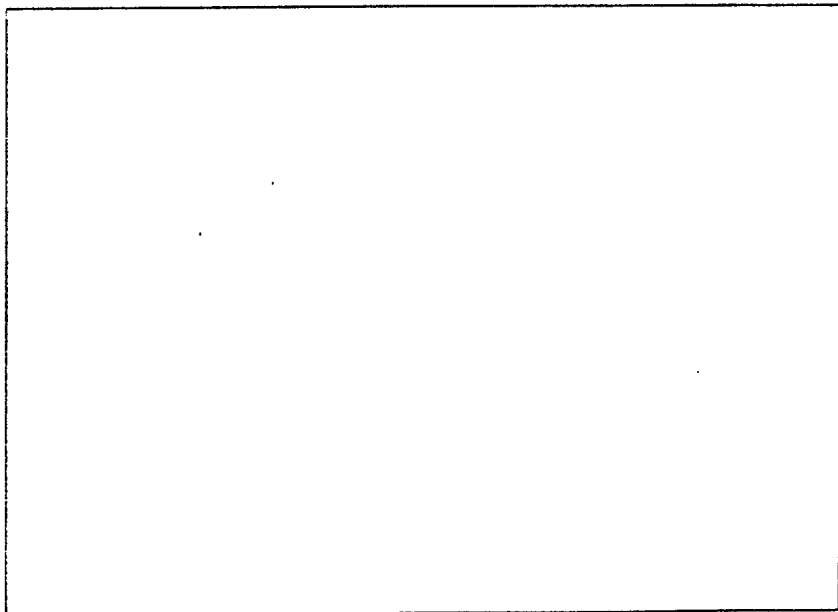
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
1/29/91	1020	1052	0	7

Abbreviations




Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Location Sketch



Fort Sheridan RI/FS

Log of Boring B122SB8

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0			Asphalt:	FM			No sample was obtained from 0.0 to 2.0 feet due to asphalt and frozen fill material. PID of breathing zone was 0.4 ppm.
			Frozen Fill: Fill of unidentified debris, <u>Fill Material</u>	FM			
			Silty Clay with Gravel 5-10% silt, <1% gravel, dark grayish brown (10YR4/2), medium plasticity, firm, moist, no apparent bedding, <u>Glacial Till</u>	CL			Sample from 2 to 7 feet was obtained at 1052 hours. Low recovery is due to jamming of sampler with clay tile from storm drain that was pierced during drilling operations.
1.75						Cement Grout	
10							
15							

Log of Well B122SB9/MW

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

N

Driller & Company: Pete Suell, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" H

Soil Sampling Device: Laskey Sampler

Date Started: 7/11/91

Date Completed: 7/11/91

Total Depth Drilled: 14

Water Level While Drilling (bgl): 8.0

Ground Elevation: 671.3984

Completion Information

Water Level At Completion (bgl): 7.21	Date: 7/11/91
Screened Interval: 6.37-11.35'	Filter Pack Interval: 5.55-11.7
Screen Length: 4.98	Bentonite Seal Interval: 1.0-5.55
End Cap Length: 0.35	Grout Interval: 0.6-1.0
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: NA
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: NA
Total Casing: 5.86	Protective Casing Type: flush mount
Top of Casing Elevation:	Protective Casing Length/AG: 1/0

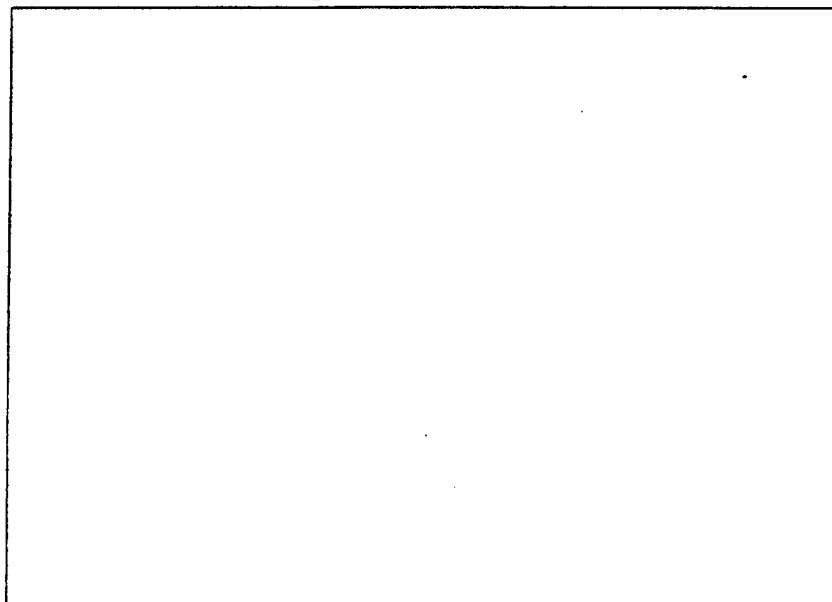
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/11/91.	0846	0949	0	14

Abbreviations

Location Sketch

Abbr.	Meaning
HSA	Hollow Stem Augers
sched	schedule
FM	fill material
some	25-35%
little	15-25%
PIO	photoionization detector
ppm	parts per million



Fort Sheridan RI/FS

Log of Well B122SB9/MW1

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Asphalt:	FM			No sample was obtained from 0 to 1 foot due to the asphalt and crushed stone. This interval was logged from the soil cuttings.
		Crushed Stone and Sand: light grey (10YR7/1), non-plastic, moist, angular. <u>Fill Material</u>	FM			
		Sand and Gravel: black (10YR2/1), non-plastic, moist, angular. <u>Fill Material</u>	FM			There was no sample recovery for the interval 1 to 4 feet, thus the interval was described by examination of the soil cuttings. Screening of the breathing air with a PID was 0.0 ppm.
0		Sand and Gravel: some fines (clay), black (10YR2/1), low to no plasticity, very moist. <u>Fill Material</u>	FM			
5		Fill: coal, ash, glass, and various other materials, saturated at 3 feet, sample also contained a small (3 inch thick) brown (10YR5/3), clay zone	FM			Sample from 4 to 9 feet was obtained at 0935 hours. Headspace screening of the sample with a PID was 0.0 ppm.
2.5			FM			
10		Fill: glass, gravel, and little fines (silt and clay), saturated	FM			Sample from 9 to 14 feet was obtained at 0945 hours. Headspace screening of the sample with a PID was 0.0 ppm.
3			FM			
		Clay: some silt, little gravel, brown (10YR5/3) with grey (10YR5/1), low plasticity, moist	CL			Clay was encountered at a depth of 12 feet based on drill pressure.
15						After sampling to 14 feet using 4 1/4" hollow stem augers, the hole was redrilled to 11.7 feet with 6 1/4" augers.

Log of Boring B122SB10

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Pete Suell, ESE, Inc.

Geologist/Logger & Company: Michael A. Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 4 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 7/10/91

Date Completed: 7/10/91

Total Depth Drilled: 14

Water Level While Drilling (bgl): Dry

Ground Elevation: 671.9656

Completion Information

Water Level At Completion (bgl): Dry

Date: 7/10/91

Grout Interval: 0-14

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/10/91	0915	0957	0	14













Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
FM	fill material
PID	photoionization detector
ppm	parts per million

Location Sketch

Fort Sheridan RI/FS

Log of Boring B122SB10

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0		Asphalt:	FM			No sample was obtained from 0 to 1.0 feet due to the presence of asphalt pavement underlain by crushed stone and sand.
		Crushed Stone and Sand: light grey (10YR7/1), non-plastic, moist, angular. <u>Fill Material</u>	FM			
		Sand: some silt, little small gravel, very dark grey (10YR3/1), non-plastic, moist. <u>Fill Material</u>	FM			Sample from 1 to 4 feet was obtained at 0920 hours. Headspace screening of the sample with a PID was 2.0 ppm.
	2.3	Clay: some silt, trace sand and gravel, light yellowish brown (10YR6/4), low plasticity, slightly moist	CL			
		Clay: some silt, few small gravel, trace sand, brown (10YR5/3), low plasticity, slightly moist	CL			Sample from 4 to 9 feet was obtained at 0935 hours. Headspace screening of the sample with a PID was 0.0 ppm.
	5.0		CL			
		Clay: some silt, little small gravel, trace fine sand, brown (10YR5/3), with a trace of grey (10YR5/1), low plasticity, slightly moist	CL			Sample from 9 to 14 feet was obtained at 0950 hours. Headspace screening of the sample with a PID was 0.0 ppm.
	5.0	Clay: some silt, little small to medium gravel, trace sand, grey (10YR5/1), low plasticity, slightly moist	CL			
			CL			
15						

Log of Boring B122SB11

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Pete Buel, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HSA

Soil Sampling Device: Laskey Sampler

Date Started: 7/10/91

Date Completed: 7/10/91

Total Depth Drilled: 9

Water Level While Drilling (bgl): 8

Ground Elevation: 670.7933

Completion Information

Water Level At Completion (bgl): 8

Date: 7/10/91

Grout Interval: 0-7.5

NO WELL INSTALLED

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/10/91	1020	1050	0	9

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
sched	schedule
FM	fill material
some	25-35%
little	15-25%
PID	photoionization detector
ppm	parts per million

Location Sketch

Fort Sheridan RI/FS

Log of Boring B122SB11

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Borehole Completion	Comments
0		Asphalt:	FM			No sample was obtained from 0 to 1 foot due to the asphalt and crushed stone. This interval was logged from the soil cuttings.
		Crushed Stone and Sand: light grey (10YR7/1), non-plastic, moist, angular, <u>Fill Material</u>	FM			
		Clay: some sand, little gravel, black (10YR2/1), low plasticity, moist, <u>Fill Material</u>	FM			Sample from 1 to 4 feet had no sample recovery.
0		Clay: some sand, little gravel, very dark grey (10YR3/1), low plasticity, very moist, a cobble was encountered at 2.5 feet, <u>Fill Material</u>	FM			
5	3.5	Clay: some sand, little gravel, very dark grey (10YR3/1), low plasticity, saturated at 8 feet, gravel, glass, and coal found throughout sample - especially from 7 to 9 feet, <u>Fill Material</u>	FM			Sample from 4 to 9 feet was obtained at 1035 hours. Headspace screening of the sample with a PID was 0.0 ppm.
10						
15						

Cement Grout

Bentonite Hole Plug

Log of Well B122SB13/MW2

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

2

Driller & Company: Pete Sust, ESE, Inc.

Geologist/Logger & Company: Michael Pozniak, ESE, Inc.

Drilling Rig: Brat I

Drilling Method: 6 1/4" HS

Soil Sampling Device: Laskey Sampler

Date Started: 7/10/91

Date Completed: 7/10/91

Total Depth Drilled: 14

Water Level While Drilling (bgl): 8.0

Ground Elevation: 670.4742

Completion Information

Water Level At Completion (bgl): 8.0	Date: 7/10/91
Screened Interval: 6.75-11.76	Filter Pack Interval: 4.6-12.9
Screen Length: 5.01	Bentonite Seal Interval: 1.6-4.8
End Cap Length: 0.31	Grout Interval: 0.6-1.6
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: NA
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: NA
Total Casing: 6.25	Protective Casing Type: flush mount
Top of Casing Elevation:	Protective Casing Length/AG: 1/0

Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
7/10/91	1120	1205	0	14

Abbreviations

Abbr.	Meaning
HSA	Hollow Stem Augers
sched	schedule
FM	fill material
some	25-35%
little	15-25%
few	5-10%
PID	photoionization detector
ppm	parts per million

Location Sketch

Fort Sheridan RI/FS

Log of Well B122SB13/MW2

Depth (feet bgl)	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0		Asphalt:	FM			No sample was obtained from 0 to 1 foot due to the asphalt and crushed stone. This interval was logged from the soil cuttings.
		Crushed Stone and Sand: light grey (10YR7/1), non-plastic, moist, <u>Fill Material</u>	FM			
		Sand and Gravel: black (10YR2/1), non-plastic, dry to slightly moist, <u>Fill Material</u>	FM			Sample from 1 to 4 feet was obtained at 1125 hours. Headspace screening of the sample with a PID was 0.0 ppm.
5		Sandy Clay: some gravel, wood, nails, very dark grey (10YR3/1), saturated at 8 feet, <u>Fill Material</u>	FM			Sample from 4 to 9 feet was obtained at 1145 hours. Headspace screening of the sample with a PID was 0.0 ppm.
10		Sandy Clay: some gravel, wood, very dark grey (10YR3/1), saturated	FM			Sample from 9 to 14 feet was obtained at 1200 hours. Headspace screening of the sample with a PID was 0.0 ppm.
15	2.5	Clay: some silt, little gravel, few sand, brown (10YR5/3), low plasticity, slightly moist, Small saturated sand seam at 13.5 feet	CL			After sampling to 14 feet using 4 1/4" hollow stem augers, the hole was redrilled to 12.9 feet with 6 1/4" augers.

Log of Well B125 MWO1

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 11/3/90

Date Completed: 11/12/90

Total Depth Drilled: 25.65

Water Level While Drilling (bgl):

Ground Elevation: 682.265

Completion Information

Water Level At Completion (bgl):	Date: 11/12/90
Screened Interval: 14.8-24.8	Filter Pack Interval: 13.1-25.65
Screen Length: 10	Bentonite Seal Interval: 10-13.1
End Cap Length: 0.35	Grout Interval: 0-10
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 17.3	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 684.755	Protective Casing Length/AG: 5/2.67

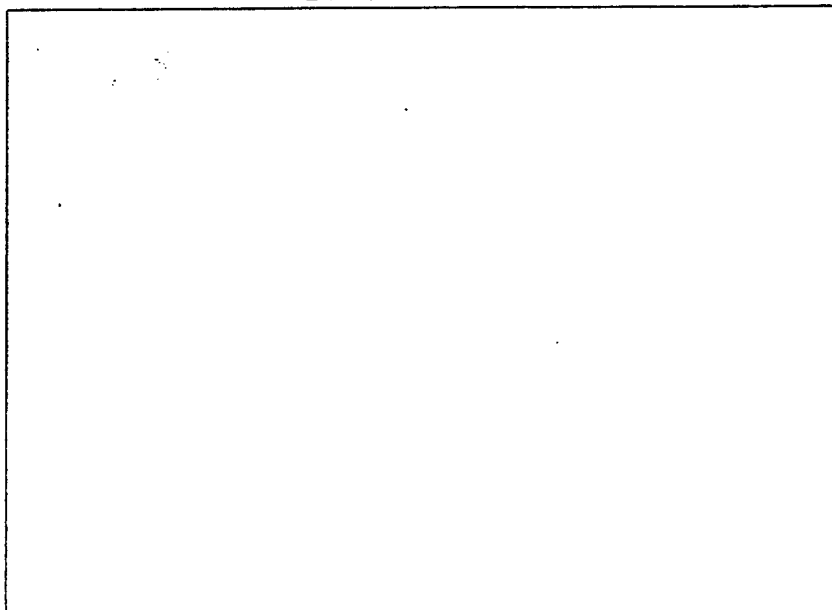
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/8/90	1415	1600	0	4
11/9/90	1000	1530	4	24
11/12/90	0845	1509	24	25.6

Abbreviations

Abbr.	Meaning
3xSS	3" x 2" Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch



Fort Sheridan RI/FS

Log of Well B125 MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0							
3			Silty Clay: 25% silt, 5% fine sand, very dark gray (10YR 3/1), Low Plasticity, soft, dry, <u>Top Soil</u> -Organic Rich	OL			11/8/90 3xSS @ 0'-2' Encountered hard fill material Hand Dug to 2 feet.
6		1.8	Silty Clay: 5% fine-coarse sand, yellowish brown (10YR 5/8), medium plastic, soft, dry, <u>Fill Material</u> , 1.7'-2' coal, brick- debris.	CL			Shut down to talk to utility personnel 3xSS @ 2'-4' cement piece in nose cone resists soils from entering sampler. Water encountered @ 3.5 feet, Stabilized after 10 minutes to 2.0' (static) Drilling down to 4' Formation break Sandy/silty clay in cuttings at 3-3.5', water trickling in open borehole 3-4 feet. Shutdown 11/9/90 Cleaning out borehole w/augers to 4 feet.
10			Gravel: dark brown (10YR 3/3)-dominant color, non plastic, loose, wet, angular gravel, with pieces of sand/gravel aggregates, also fly ash (?) - consolidated, <u>Fill Material</u> .	GW			
11							
8		0.9					
8							
7							
6			Silty Clay: 25% silt, 5% fine sand, yellowish brown (10YR 5/6) and mottled w/ gray (10YR 5/1), medium-high plasticity, medium stiff, moist-dry, -wood fragments, <u>Fill Material</u> .	CH CL			3xSS @ 4'-6' Drilling down to 6 feet
8		2.0					
11							
18							
--			Silty Clay: 20% silt, 5-10% fine gravel, 5-10% F-coarse sand, mottled yellowish brown (10YR 5/6) and gray (10YR 5/1), low plasticity, v-stiff, dry, <u>Clay Till</u> .	CL			3xSS @ 6'-8' Hydraulic hoses on automatic hammer too short, will have to push first foot. Drilling down to 8 feet Fairly Hard drilling Cuttings are wet, but could be coming from zone above while drilling to 8 feet. Water in augers, probably running down flights from zone above.
13		2.0					
22							
9			Silty Clay: 20% Silt, 10% F-coarse sand, 5% medium gravel, mottled dark yellowish brown (10YR 4/6) and gray (10YR 5/1), low plasticity, v. stiff, dry, no bedding or fabric, <u>Clay Till</u> .	CL			
18		1.9					
25							
32			Silty Clay 20-25% silt, 10% f-medium sand, >5% fine-large gravel, dark yellowish brown (10YR 4/4), medium plasticity, stiff-v. stiff, dry, no bedding, <u>Clay Till</u> .	CL			3xSS @ 10'-12' drilling down to 12 feet v. hard drilling
10							
14		1.7					
20							
26			Silty Clay 20-25% silt, 5-10% F-coarse sand, >5% fine-large gravel, dark yellowish brown (10YR 3/6), low plasticity, v. stiff- hard, dry, <u>Clay Till</u> -one small moist wet sandy layer @ 13 feet.	CL			3xSS @ 12'-14' Drilled down to 14'
13							
18		1.8					
25							
33			Clay: 10% silt, 5% fine-coarse sand, 5% fine-medium gravel, V. dark grayish brown (10YR 3/2), medium plasticity, stiff, dry, no bedding, <u>Clay Till</u> .	CL			3xSS @ 14'-16' Drilling down to 16'
9							
15							

Fort Sheridan RI/FS

Log of Well B125 MW01

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
24				CL			
33							
9			Clay: 10-20% silt, 5% F.-medium sand, v. dark grayish brown (10YR 3/2), medium-high plasticity, medium stiff, dry-sl. moist.	CH			3"x2" SS @ 16"-18" Still H ₂ O in augers from upper zone.
13	2.0						
15							
21			Clay: 10% silt, 5% F-C sand, 5% fine-medium gravel, v. dark grayish brown (10YR 3/2), medium-high plasticity, medium stiff, dry.	CH			Drilling down to 20 feet
7							
12	2.0						
16							
19			Clay: 10% silt, 5% fine sand, >5% coarse sand, >5% small-large gravel, v. dark grayish brown (10YR 3/2), high plasticity, medium stiff, dry.	CH			3"x2" SS @ 20"-22"
6							
12	2.0						
15							
19			Clay: 10% silt, 5% F-coarse sand, 5% fine-medium gravel, v. dark grayish brown (10YR 3/2), high plasticity, soft-medium stiff, dry.	CH			3"x2" SS @ 22"-24"
6							
10	1.9						
14							
19							
							11/12/90 Bottom of Augers @ 22 feet Water in augers to 2.5' below ground level Lowering center bit into hole Drilled down to 25 feet, preparing to set well pulling rod out of augers sounded bottom of borehole through augers (25.65' BGL)
							1017 Added 1 st bag of sand 1025 Added 2 nd bag of sand 1035 Added third bag of sand Stainless steel weight broke off of measuring tape @ 19 feet BGL Added 4 th bag of sand have pulled 10 feet of augers Added 5 th bag of sand Measured sand to 15 feet BGL. Added 6 th bag of sand : 14 feet BGL will add one more Added total 8.5 bags- Measured to sandpack = 13.1' BGL Viscous native fluids causing sand to not settle Pumped out liquid in boring to 8 feet BGL Add bentonite pellets Pellets floating - pushing down w/ AW Rod -

Log of Well B125 MWO1B

Fort Sheridan RI/FS

Contract Number DAAA15-90-D-0017

Driller & Company: Lester Johnson, ESE, Inc.

Geologist/Logger & Company: James S. Guentert, ESE, Inc.

Drilling Rig: CME-55

Drilling Method: 6 1/4" HSA

Soil Sampling Device: 3" x 2" Split Spoon

Date Started: 11/12/90 Date Completed: 11/13/90

Total Depth Drilled: 8

Water Level While Drilling (bgl):

Ground Elevation: 668.567

Completion Information

Water Level At Completion (bgl): 2.8	Date: 11/13/90
Screened Interval: 1.90-6.90	Filter Pack Interval: 1.1-8
Screen Length: 5	Bentonite Seal Interval: 0.75-1.1
End Cap Length: 0.35	Grout Interval: 0-0.75
Screen Type/Dia.: 10 slot PVC/4"	Mortar Collar Interval: -0.5-0
Casing Type/Dia.: sched 40 PVC/4"	Drainage Port Height: -0.525
Total Casing: 5.39	Protective Casing Type: Stick-up 6"
Top of Casing Elevation: 665.907	Protective Casing Length/AG: 5/3.60

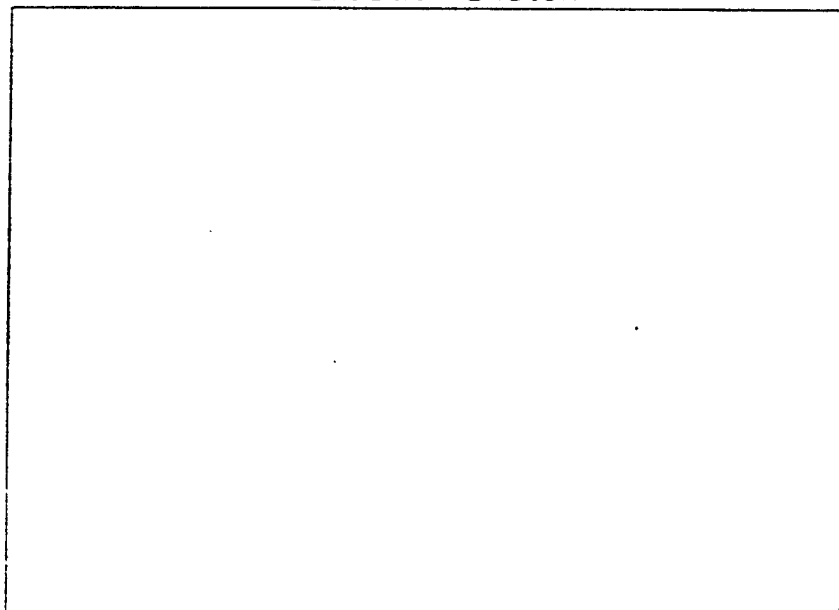
Drilling Shifts

Date	Time		Depth of Drilling Per Shift	
	Start	End	Start	End
11/12/90	16:15	1900	0	8.0
11/13/90	1002	1030	--	--

Abbreviations

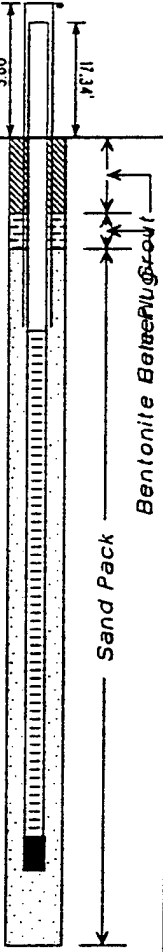
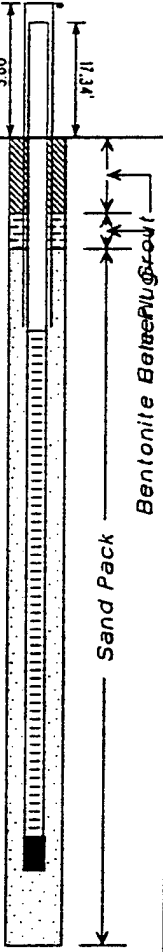
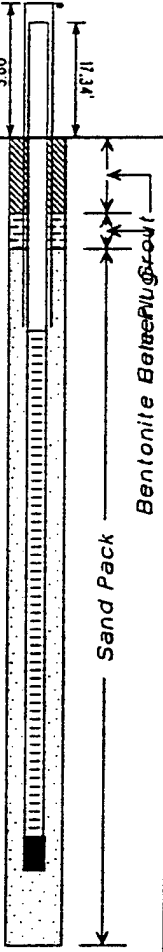
Abbr.	Meaning
3xSS	3" x 2' Split Spoon Sampler
<5%	Component Present, but less than 5%
BGL	Below Ground Level

Location Sketch



Fort Sheridan RI/FS

Log of Well B125 MW01B

Depth (feet bgl)	Blow Counts	Amount Recovered (feet)	Soil Description	USCS Classification	Lithologic Log	Well Construction	Comments
0			Silty Clay: 20-30% silt, 5-10% fine sand, dark gray (10YR 3/1), low plasticity, soft, dry - topsoil description from cuttings and drill characteristics.	CL			11/12/90 Drilling down to 7 feet to set well (west from SB01A) Reached saturated cuttings @ 3 feet. Fuel odor in cuttings. Drilled to 4.5 feet
			Sandy Clay: 25% fine sand, 0% silt, yellowish brown, med-high plasticity, soft, sat @ 3 feet - description from cuttings and drill characteristics.	CH			
5			Sandy Clay: 25% fine sand, 0% silt, dark olive brown (2.5Y 3/3), highly plastic, soft-medium stiff, - description from cuttings.	CH			1.5 ppm on OVM in cuttings at 5.5 feet -Harder drilling @ 6 feet (clay till) Drilling down to 7 feet
			Not Logged	NL			
9			Silty Clay: 25% silt, 5% fine sand, <5% fine gravel, mottled yellowish brown (10YR 5/4) and gray (10YR 5/1), low plasticity, stiff, no bedding, Clay Till.	CL			3xSS @ 7'-9' drilled down to 8 feet
18	2.0						
29							
22							
10							Installed well and casing Added 1 bag of sand, pulled augers 2 feet. Added 2 bags of sand pulled augers 2 feet. Added 3rd bag of sand Sand to 1.3' BGL Added bentonite pellets up to 0.75' Hydrated hole plug Placed locking cap into well casing top 11/13/90 Pusing down well procover Added cement/bentonite grout to surface.
15							